Competitive sport and personality development

Tattersfield, C. Roy

COMPETITIVE SPORT AND PERSONALITY DEVELOPMENT

BY

C. ROY TATTERSFIELD

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ABSTRACT

The purpose of this longitudinal study was to investigate the possible effects there might be on the development of personality of boys aged twelve to fourteen years during their involvement in a highly competitive sports environment.

The competitive group was composed of 106 boys who competed regularly in the Amateur Swimming Association's Age Group competition and were drawn from swimming clubs throughout N.E. England. Each competitor was matched with a boy in the non-competitive control group in terms of chronological and mental age, of social and educational background and in strength. Personality aspects were measured by Cattell's High School Personality Questionnaire and the Junior Eysenck Personality Inventory, the tests being administered annually. The data was analysed by multiple discriminant analysis and analysis of variance techniques.

Principal findings were that the total personality profile of the competitive group changed significantly (.01) relative to that of the control group. In terms of higher order personality factors the competitive group became more extrovert and were less anxious than the control group, there was no difference in Cortertia (cortical alertness) but the control group demonstrated a greater level of Independence.

Subsidiary comparisons of the personality profile of competitors classified as being most and least successful revealed a significant discriminant function (.05) at the conclusion of the study. Univariate analyses of higher order factors did not reveal any significant differences

between the groups. In comparisons between these groups and a group of boys who dropped out of competition no significant differences were found either in total personality profile or in higher order personality factors at twelve years of age.

The results are discussed with reference to previous research in the field and conclusions are drawn regarding the desirability of competitive sport in an educational context.

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C.R.T.

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CHAPTER I

INTRODUCTION

Opportunities for boys of school age to participate in competitive sport have increased greatly in recent years. Such opportunities now occur both in sports traditional to Britain and in the many recently developed sports which are either new to this country or were formerly the prerogative of the wealthy.

Once a sport has been developed there invariably arises a desire by the participant for competition and subsequently for championships. Indeed Lorenz[1] suggests that the competitive element is always there even in sports where the enjoyment comes through performing a skilled movement for its own sake. He further states that there is no sport in which contests are not held.

Thus there are now opportunities for competition in a wide variety of sports both of a team and of an individual nature. It is possible for boys of twelve to win national titles. In order to do so they of necessity have to spend a great deal of time perfecting technique, developing fitness and gaining competitive experience. The desirability of boys of this age being involved to the extent that many are

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[1]Konrad Lorenz, On Aggression, London: Methuen and Co. Ltd., 1966, p.241.

in a competitive environment is a matter of some conjecture. Of the many questions that can be posed the one which this study is principally concerned is whether frequent and regular exposure to a highly competitive environment has any effect on the personality development of boys.

The type of competition which is considered in this study is that of an individual nature where the participants compete with each other on a one to one basis, as in judo, or against a number of individuals all acting independently, as in swimming or athletics. The form of competition in other words where a competitor succeeds or not through his own abilities, unaided by team members.

The Development of Individual Competitive Sport

Organised individual competitive sport for boys of school age can be traced back certainly as far as the Ancient Olympic Games. Schöbel[1] citing Pausanias[2] states that competitions for boys under the age of eighteen years were first held at the 37th Games in 632 B.C. The same author[3] again quoting Pausanias[4] as his source, reports that in the 103rd Games in 368 B.C. a winner is recorded who was only twelve years of age.

The development of competitive sport for boys in

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[1]Heinz Schöbel, The Ancient Olympic Games, London: Studio Vista, 1966, p.97.

[2]Pausanias, Descripto Graeciae A.D. 160-180, v 8 iii.

[3]Schöbel, Op.cit., p.134.

[4]Pausanias, Op.cit., vi 2 v.

Britain has largely taken place during the present century and more particularly during the last twenty-five years. However, several centuries earlier, activities of an individual competitive nature had been recommended as playing a part in the education of the young, and were included in the curricula of a few of the early schools in this country. Elyot[1] in his treatise on the education of the ruling class published in 1531, listed activities which were suitable for a gentleman to pursue, amongst these were running and swimming. McIntosh[2] states that one of Elyot's three main objectives of physical activity was that of enrichment of the personality, the other two being social success and physiological efficiency.

In 1570 Asham,[3] a leading educationalist of his time, recommended that boys should be given a comprehensive introduction to sports and pastimes. Amongst a number which he considered suitable were running, leaping, wrestling and swimming. Mulcaster who was Headmaster of Merchant Taylors' School from 1560-1586 included physical activities in his curriculum and in his book published in 1581 mentions wrestling, fencing and swimming as suitable activities to

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[1]Thomas Elyot, The Governour 1531 1 16-21, cited by P.C.McIntosh et al in Landmarks in the History of Physical Education, London, Routledge & Kegan Paul, 1957, p.74.

[2]P.C.McIntosh et al, Landmarks in the History of Physical Education, London, Routledge & Kegan Paul, 1957, p.75.

[3]Roger Asham, The Schoolmaster, 1570, cited by J.A.R.Pimlott in Recreations, London, Studio Vista, 1968, p.21.

pursue[1]. Burton[2] writing in 1621 made an analysis of recreations practiced at that time and of those of an individual athletic nature listed wrestling, leaping, running, fencing and swimming.

It was not until the middle of the nineteenth century that sport became a generally accepted part of the school curriculum. Discussing the lack of enthusiasm on the part of the staff at the Public Schools for competitive sports in the early part of that century, Pimlott[3] states that with few exceptions

> ".....most schoolmasters before the fifties were indifferent or hostile to the games the boys organised amongst themselves and positively disapproved of competitive matches with other schools."

At this time team games were the favoured activities of the boys and later gained support of Headmasters such as Arnold at Rugby. It is of interest to note however that McIntosh[4] reports that racquets was one of the three main sports at Harrow in the eighteen twenties and that Arnold's personal interests were in activities of an individualistic

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[1]Richard Mulcaster, Positions, 1581, cited by P.C.McIntosh et al, Op.cit., pp.76-77.

[2]Robert Burton, Anatomy of Melancholy, 1621, cited by J.A.R.Pimlott in Recreations, London, Studio Vista, 1968, pp.21-22.

[3]J.A.R.Pimlott, Recreations, London, Studio Vista, 1968, p.47.

[4]Peter C.McIntosh, Physical Education in England Since 1800, 2nd ed., London, Bell, 1968, p.30.

nature such as swimming[1]. There followed a change of attitude by schoolmasters and a policy of active encouragement of sports ensued. Pimlott[2] recounts that about mid century the belief in sport as an aid to character building became fashionable and was reported on favourably by the Clarendon Commission on Public Schools in 1864.

The position with regard to the provision of competitive sport for boys in the State Schools showed marked contrast to that in the Public Schools. Within the timetable, physical activity in the late nineteenth century consisted of drill or exercises. However competitions in both major games and in individual sports were being held as extra curricular activities. McIntosh[3] reports that by 1895 competitions in football, cricket, athletics and swimming were being developed on a local inter school basis through the enthusiasm of pupils and teachers and without financial backing from either local or central government. In the Board of Education Report of 1900[4], recognition was given to games as an alternative to Swedish drill in Elementary Schools. However lack of suitable facilities meant that for many years curricular physical activities continued to be of calisthenic variety. The official publications of the Board of Education during the period 1900-1930 clearly indicate the emphasis given to gymnastic systems as the curricular physical activity in the

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[1] Ibid, p.28.

[2] Pimlott, Op.cit., pp.47-48.

[3] McIntosh, Op.cit., p.122.

[4] Board of Education Annual Report, London, H.M.S.O., 1900, p.633.

Elementary Schools (to which of course the majority of boys went) during these years. The 1904[1], 1909[2], and 1919[3] syllabuses were devoted almost entirely to calisthenics with a very few pages describing simple minor games. A 1920 publication[4] consisted mainly of descriptions of simple minor games but major games, football, cricket and athletics were now mentioned. Between 1919 and 1927 the Board issued eleven publications on physical activities, ten on gymnastics and one on games. A major change can be seen in the 1933[5] syllabus which was much more broadly based in terms of activities. Exercises and minor games still receive heavy emphasis but there are also whole sections dealing in some detail with the teaching of major games, dancing, swimming and athletics. In the 1937 Board of Education publication[6] the last named activities are given about as much space as is gymnastics.

Activities of a more recreative-competitive type were being introduced into the Elementary Schools during the

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[1]Board of Education, The Syllabus of Physical Exercises for Schools, London, H.M.S.O., 1904, p.124.

[2]Board of Education, The Syllabus of Physical Exercises for Schools, London, H.M.S.O., 1909, pp.168.

[3]Board of Education, The Syllabus of Physical Training for Schools, London, H.M.S.O., 1919, pp.227.

[4]Board of Education, Suggestions in Regard to Games, London, H.M.S.O., 1920, pp.71.

[5]Board of Education, Syllabus of Physical Training for Schools, London, H.M.S.O., 1933, pp.352.

[6]Board of Education, Recreation and Physical Fitness for Youths and Men, London, H.M.S.O., 1937, pp.284.

thirties and swimming had been regarded as a worthwhile part of the curriculum before then. Indeed in 1930 the Board of Education[1] reported

> "Whatever else may be absent from the scheme of physical training in an area swimming usually finds a place where facilities are available."

During these years the Grammar Schools had closely followed the Public School pattern developing initially team games and later also including competitive sport of an individual nature both as curricular and extra curricular activities.

Governing bodies of sports were set up during the later part of the nineteenth century and throughout the present century and developed a competitive structure for juniors[2] which provided opportunities for boys to take part in competitive sport in and out of school environment. The 1933 Syllabus[3] mentions the increase in opportunities for pupils to take part in outside competitions as well as school events and requests teachers to keep a careful watch on the amount of competition gifted pupils are asked to perform.

As has been shown, as the present century progressed opportunities for boys to take part in competitive sport increased. However it was not really until the implementation

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[1]Board of Education, The Health of the School Child, London, H.M.S.O., 1930, p.78.

[2]The age limits denoted by the term "junior" vary between sports within the range of 8-20 years - see pages 11-19.

[3]Board of Education, Syllabus of Physical Training for Schools, London, H.M.S.O., 1933, p.41.

of the 1944 Education Act that there has been nation-wide opportunity for boys to take part regularly in a variety of sporting activities and competitions in particular those of an individual nature. During the last twenty years facilities have greatly improved, there has been a steady supply of specialist teachers and it has been possible to provide a broad programme of curricular and extra curricular activities ranging from traditional games to outdoor activities such as canoeing and indoor activities such as judo. One of the recommendations of the Newsom Report[1] in 1963 - a report dealing with the education of 13-16 year old pupils of average and less than average ability - was that there should be a broadening of the Physical Education programme from traditional team games. This broadening had already taken place in more progressive schools and authorities, before publication of the report and is being pursued now by the majority of local education authorities. As the number and type of physical activities that are taught in schools and outside clubs has increased so has the opportunity for, amount of, and degree of competition. In the individual sports the position has so changed during this century that whereas at the beginning there was hardly any opportunity for the majority of boys to take part in competition, today almost any boy can enter competitions which culminate in national championships and international representation.

Whilst there are a large number of sports in which boys

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[1]Central Advisory Council for Education in England, Half our Future, London, H.M.S.O., 1963, p.139.

of school age can participate in individual competition up to national championship level, those which appeared to have the largest number of entrants in 1967, when this study was commenced, were the sports of athletics, swimming, tennis and judo, the latter having replaced boxing as the most popular individual combative sport. Of these, tennis was the first activity at which a boy could become a national junior champion.

The Lawn Tennis Association held its first Junior Championship in 1908 and introduced junior covered court championships more recently in 1955. The present age groupings are under 18, under 16 and under 14 on January 1st of the year in which competition is held. In 1967 160 accepted entrants participated in the final stages of the national tournament, these being the players who have proved their ability by results obtained in country tournaments, county championships and open junior championships. The Boys' Schools Lawn Tennis Association held its first national championship in 1961, there being no age limit, and followed this a year later with Junior Championships for boys under 15 on January 1st in the year of competition. In 1967 there were 144 boys in the senior event and 112 in the junior event. A clearer indication of the number of school children taking part in competitive tennis is reported by Milbourn[1] who stated that in 1967 over 10,000 boys and girls took part

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[1]F.McI.Milbourn, The Boys' Schools Lawn Tennis Association Bulletin, 10:1 (October 1967), p.8.

in a nationally organised Schools Ladder Tournament and that numbers were expected to double, within a few years.

In contrast to the long established national competition in junior tennis, that in the sport of judo is of recent origin. The British Judo Association held its first junior championships for under 16 year olds in 1967, teams for these being selected by the constituent area associations. National selections for the purpose of gaining membership in the national team however date from 1956. The entries for these trials number about 100 annually, in two age groups 16-18 and 19-21. The British Schools Judo Association was formed in 1963 and in that year had 250 members. Growth has been extremely rapid and a survey in 1966 by Saunders[1] revealed a membership of twelve thousand, a year later the figure stood at seventeen thousand. The first championships were held in 1965 and in 1967 200 competitors who had survived area eliminations competed for national titles in under 14, under 16, and under 20 age groups, the day of the championships being the deciding date.

The Amateur Athletic Association held its first national junior championships in 1934. Records of this are incomplete but the age group rules at the time indicate that the upper age limit was 18 years. In 1967 the age groups were: Boys, 13 and under 15; Youths, 15 and under 17; Juniors, 17 and under 19; on September 1st of the year of competition.

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[1]Brian Saunders, "The British Schools Judo Association - its History", British Schools Judo Association Year Book, 1967-68, pp.34-44.

National Championships are held for the Youths and Junior age groups but not for the Boys, and in 1967 there were 244 entries in the junior championships, these were the competitors who had been successful and had attained required standards in County and Area Championships.

For cross country the age groups are one year older than for the track and field championships, again competition at national level being for the Youth and Junior Age Groups. Green[1] records that in the 1967 championships there were 388 starters in the Junior event and 438 in the Youth event.

According to Foyston[2] the first national championships held by the English Schools Athletic Association took place in 1925 when thirteen county associations sent teams of competitors under the age of 14, to take part. By 1939 there were 29 affiliated county associations and this had increased to 40 by 1954. Current age groupings are:: junior, under 15; intermediate, under 17; and senior, under 20; on September 1/2 of the year of competition. In 1925 there were 5 track and 2 field events for boys and by 1967 this had increased to 21 track and 24 field events for boys. Just over 1,200 boys took part in the championships, having progressed through school, town and county championships. The successful competitors compete for the national team in a home international match and in 1965 and 1967

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[1] P.W.Green, "National Cross Country Championships Results", Athletics Weekly, 21:10 (March 11, 1967) pp.29-35.

[2] A.Foyston, "History and Growth of the English Schools Athletic Association", Mimeographed, E.S.A.A. 1960, pp.1-3.

took part in international competitions in Canada. Age groupings for cross country championships are the same as for track and field and the first national championships were held in 1960. In 1967 900 boys competed in the races for the three age groups.

Competition for juniors up to the national level in swimming started in 1947 when the first Junior Championships were introduced by the Amateur Swimming Association for boys and girls under the age of 16 on December 31st in the year of competition. In 1968 the age limit was changed to 17 years. Entry to these championships is decided by fixed standard times, and pre-national championships include, Club, City, County and District Competitions.

The first national championships of the English Schools Swimming Association were held in 1950. The progression here of the aspiring champion is through School, Town, County and District championships. Each of the 13 member districts then enter for the national championships one individual for each event in the three age groups of 12-14, 14-16 and 16-19 (as at September 1/2 in the year of competition). Each year approximately 400 swimmers and divers take part in the national finals.

Despite the later start with nationally organised competition than was the case in athletics and tennis, competition for school children in swimming is probably the most highly developed of all the sports, this being particularly so up to the age of 17. This development has been enhanced in recent years by the introduction by the Amateur Swimming Association of a National Age Group Swimming

Competition.

This form of competition had its origins in the U.S.A. where it became a nationally organised competition in 1953 and since when it has developed into a mammoth competition, indeed Brown[1] states that an estimated 500,000 swimmers take part annually in the age group competition in the United States. The competition is not confined to England and the U.S.A. however, and in 1967 Brown[2] noted that there were at least 33 countries actively engaged in age group competition. The number of countries organising age group competition has increased further since then and during 1969 the same author reported results of competitions from countries in Asia[3] and in Africa and Latin America[4]. In England the system of holding competitions for swimmers in one year or two year age groups had been in vogue at club and county level for some years, Brown[5] records that an inter-county age group competition took place between Kent, Surrey and Essex in 1955. At national level the Amateur Swimming Association introduced championships for 11, 12, 13 and 14 year olds in 1966.

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[1] R.Brown, "Do you Age Group?" Swimming Times, 39:12 (December 1962), p.410.

[2] R.Brown, "Age Group is World Wide", Swimming Times, 44:5 (May 1967), p.152.

[3] R.Brown, "Age Group Swimming", Swimming Times, 45:6 (June 1968), p.244.

[4] R.Brown, "Contests in Other Countries", Swimming Times 46:9 (September 1969), p.414.

[5] R.Brown, "Inter County Age Group Competitions", Swimming Times, 42:8 (August 1965), p.295.

A 15 year old age group was added in 1969. The age group in which a swimmer competes being determined by his birthday during the year of competition. The progression to a national title is through Club, City, County and District Championships. For the championships of 1966-1969 each of the five districts sent two competitors for each event in each age group to the national finals. Thus some 400 swimmers took part in the final stages. According to the A.S.A. Press Officer, Pope[1], these 400 had survived the eliminating rounds entered originally by 30,000 swimmers. This is larger than the figure of 20,000 entries expected by Brown[2] which was based on the county and district numbers of 16,000 taking part in 1965 local competitions. Entry requirements for the national finals were changed for the 1970 season to open entry with time qualifications. Age Group diving competitions up to national level were introduced by the A.S.A. in 1969. The age groups being 12 and under, 13 and 14, 15 and 16, with the higher age in the year of competition being relevant.

With the development of this form of competition in many countries, has come a desire for international competition, indeed Brown[3] reports the first European Junior Championships were held in 1967, the age in this case being under 15. Britain entered for the first time in 1969.

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[1]Colin Pope, "Massive Search for Talent", Programme National Age Group Swimming Competition 1966, p.27.

[2]R.Brown, "Age Group Swimming", Swimming Times 42:12 (December 1965), p.490.

[3]R.Brown, "First European Junior Championships", Swimming Times, 44:10 (October 1967), p.352.

With a view to international competitions Schoenfield[1] put forward a case for uniform rules for Age Group Swimmers throughout the world. At present these vary from country to country, some allowing competitions at a much younger age than that currently organised in England. Schoenfield indicates that E.Germany has an Under 8 Age Group, a competitive age group also in Australia and at State, but not national level in U.S.A. Brown[2] has pointed out that at the first national age group championship in Scotland there was an under 8 age group and on another occasion Brown[3] makes a plea for competitions at national level for under 10s in England, this already being an age group at county level.

A contrasting view is taken by Wicks[4] who proposes that less emphasis be put on younger age groups and that the programme should be increased at the older end of age group competitions, citing the loss to sport of boys and girls over present age group age, especially those not continuing full time education. She points out that when competition becomes important to an organisation or a community the basic tactic is to develop a younger reserve pool of swimmers, e.g. under 10s for the 12 year old, in turn under 8s to

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[1] A.Schoenfield, "World Uniformity Needed in Age Groups", Swimming World, 6:10 (October 1965), p.3.

[2] R.Brown, "Age Group Swimming", Swimming Times 42:4 (April 1965), p.133.

[3] R.Brown, "Age Group Swimming", Swimming Times 42:3 (March 1965), p.92.

[4] Rose R.Wicks, "The Deficiency of Age Group Swimming", Swimming World, 6:3 (March 1965), p.7.

to serve as a pool for under 10s. She further considers that children of this age do not handle the pressures and work involved as well as the more mature, older age groups, and she recommends that there should only be internal club competitions for these younger ages.

Referring to possible dangers inherent in competitive situations the Senior Inspector of Physical Education for the L.C.C. (now I.L.E.A.) McIntosh[1] states that this danger is not so much in the field of play and..... "threatens not so much the spirit of the game but the personality of the sportsman in training". He elaborates this statement as follows:-

> "Training for first class competition is long and arduous and absorbing. In such a situation the child may well be subjected to pressures which he is too young to recognise and resist. They may arise from an interest of the press or sports goods manufacturers, from the concern of the school for its reputation, from the desire of the coach or teacher to promote his own professional status and even from the ambition of parents for their children's success. Perhaps the dangers are more apparent in swimming than in most sports but they are not confined to swimming."

This clearly displays a certain disquiet and uncertainty with regard to the place of competitive sport in the education of the young and queries its possible effect on the personality of children. This concern has been expressed particularly in the United States where competitive sport for school children is without doubt much more highly

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[1] P.C.McIntosh, "Sport in Physical Education", The Olympic Academy, 3 Athens, Hellenic Olympic Committee 1963, p.116.

developed and intensive than is yet the case in Britain. This concern has been particularly voiced regarding the desirability of inter-scholastic competitions for children in Elementary Schools, up to the age of 12 years; and in Junior High Schools, up to the age of 15 years. Predictably, opposed view points have been expressed. Anderson[1] accurately summed up the position in the United States when he stated "The appropriateness of inter-school competitive sports for pre-high school age children has been one of the most controversial issues in education during the past fifteen to twenty years".

The discussion regarding the desirability of competitive sport for the young has largely been related to the effects on the physiological and psychological development of the child and most educators have tended to give their deliberations on one or other of these. Cureton[2] however considers that the two aspects cannot really be separated. He states that personality is responsive to training (a necessary corollary to competition) due to changes which have been shown to take place in various measures of the autonomic nervous system and cardio-vascular systems of competitors. Associated with

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[1]Robert B.Anderson, "A Study of Personal Adjustment and Social Status Measures of Non Participants and Athletic Groups of Boys, 10-15 Years" Microcarded Ed.D. Dissertation, University of Oregon, 1965, p.9.

[2]Thomas Kirk Cureton, "Physical Training Produces Important Changes, Psychological and Physiological" in Sports Medicine - Proceedings at International Symposium of the Medicine and Physiology of Sports and Athletics, M.J.Karvonen, Ed. Helsinki, Finish Association Sports Medicine 1953, p.49.

these physical changes, he states, are shifts from the non-energetic attitudes and characteristics of the parasympathetically dominated type to the relatively more energetic status of the sympathetically dominated type[1]. He therefore considers that personality itself is responsive to training:

> "Men are more energetic, more buoyant and optimistic, more action-minded, more playful, more aggressive - in general they appear more extravert and healthful when they are trained than when they are untrained."

In an earlier publication Cureton[2] whilst giving full support to the physiological benefits of competition to a child concedes that objections to strenuous sports competitions for the young are more legitimate on psychological grounds and suggests that high emotional pressure, late travel and loss of sleep are possible reasons for such objections.

Misangyi[3] is another who considers that personality changes do take place as a result of training and competition. He suggests that whilst basic character cannot be changed, psychic factors which are totally lacking cannot be created, but those which exist can be cultivated. He lists the qualities of volition of a trained competitor as being pursuance of objective, self sufficiency, ability to take decisions, determination and self command.

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[1] A brief explanation of the autonomic nervous system is given in the Appendix, p.415.

[2] Thomas Kirk Cureton, Physical Fitness Appraisal and Guidance, London, Henry Kimpton, 1947, p.315.

[3] O.Misangyi, "The Will Power of the Competitor", The Olympic Academy, 2, Athens, Hellenic Olympic Committee, 1962, p.155.

Lambertini[1] also considers that the young athlete will manifest certain positive attitudes and suggests that he will be self confident, sensitive towards others and be motivated to aid younger companions more insecure and less well-trained than himself.

Reviewing the records available at the time Hale[2] concludes that this evidence indicates that American pre high school age children (up to age 12) benefit considerably from inter scholastic sports competitions. He contends that children who participate in competitive sport exhibit many desirable personality traits and are generally better adjusted than those who do not compete.

Laymann[3] also considering the available evidence of the problem of competitive sport gives more guarded support. She considers that given certain safeguards competitive sport may enhance learning, social development and the acquisition of desirable personality traits. However, she concludes that most of the mental health benefits of competitive athletics can be realised through internal competition within educational establishments.

Dahlstrom[4] whilst pointing out that competition is an

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[1]G.Lambertini, "Morphological and Psychological Tracts Related to the Activity of the Athlete", Health and Fitness in the Modern World, Chicago, The Athletic Institute 1961, p.253.

[2]Creighton Hale, "What Research Says About Athletics for Pre High School Age Children", Journal of Health Physical Education and Recreation, 30:12 (December 1959), p.21.

[3]Emma Laymann, "Contributions of Exercise and Sport to Mental Health", in Science and Medicine of Exercise and Sports, Warren R.Johnson, Ed., New York, Harper, 1960, p.589.

[4]Grant Dahlstrom "What Stand on Competition", Children in Focus, Their Health and Activity, Washington D.C., A.A.H.P.E.R., 1954, p.156.

inevitable consequence of human relations in a social group, stated that from our present knowledge it was clear that there are important dangers in the careless utilisation of competitive situations. He further stated that much remained to be learned about the long range effects, as well as the problem of implementing competitive situations efficiently and safely.

Hein[1] too points to the lack of clear evidence on the emotional effects on children of participation in competitive sport. He states that the available evidence leaves the problem unsettled and leaves to local communities the decision on what should be played, and the intensity of play on educational grounds.

More recently Frost[2] has re-emphasised the lack of such clear evidence when he stated:

> "While there are claims for the role of sport as a wonderful medium for the development of desirable character traits the evidence is not conclusive. There is insufficient evidence and too little proof that desirable traits accrue from sports 'per se' and that they carry over into other phases of life. There is however a great deal of testimony on the part of those who have competed, indicating the lessons learned and the values of such competition."

However even with competitors who have been at the top of their sport there is divergence of view regarding possible effects on personality through involvement in

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[1]Fred V.Hein, "Educational Aspects of Athletics for Children", Journal of American Medical Association 168 (November 1958), p.1434.

[2]Reuben B.Frost, "Some Psychological Implication for Olympic Sports", The International Olympics Academy, 5, Athens, Hellenic Olympic Committee, 1965, p.145.

competitive sport. Roger Bannister[1], the first man to run one mile in less than four minutes, clearly holds the view that competitive situations assist in developing ones personality and particularly advocates the pursuance of some competitive activity during adolescence. In contrast Ron Clarke[2], the leading distance runner in the world during the sixties, considers that fundamentally athletes do not change as persons from the moment they start running to when they retire.

Some of those whose profession is concerned with producing champion sportsmen have expressed the view that participation in competitive sport does have an effect on developing personality. Don Talbot[3], a leading swimming coach in Australia during the sixties considers that swimming demands so much time, and so much self discipline and drive is needed in order to succeed that involvement must exert a large influence on character development. Cecil Colwin[4] a swimming coach from South Africa of international repute states that from the situations a swimmer experiences

> "....there come habits or dispositions which constitute permanent trends in his approach to specific learning situations and to life's problems as well."

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[1]Roger Bannister, The First Four Minutes, London: Putman and Co., 1955, pp.218-219.

[2]Ron Clarke, The Unforgiving Minute, London: Pelham Books, 1966, p.167.

[3]Don Talbot, Swimming to Win for all Ages, London: Pelham Books, 1967, p.37.

[4]Cecil Colwin, On Swimming, London: Pelham Books, 1969, p.131.

The debate in the United States on the topic of competition for school children prompted in 1962 a platform statement by the Division of Men's Athletics[1] (Competitive Sport) of the American Association of Health Physical Education and Recreation. They recommended that up to the age of 12 years competitions should be limited to informal games between teams from two or more schools and sports day for teams from several schools. That attendance of student spectators should be discouraged and participation of all pupils encouraged. With regard to the 12-15 age group they recommended a limited, carefully controlled inter scholastic programme of sports and stressed the need for provision of educational experiences rather than winning teams. In giving this restricted support to competition for the young they stated:

> "The intense and challenging situations in sports competitions provide the youth with socially acceptable channels through which he may express his aggressive tendencies and expend his excess energy. Opportunities in which he may control many of his anti-social tendencies through sublimation and in which he may compensate for real or imagined inadequacies - are abundant. In sport he can express his emotions vigorously in a socially acceptable manner."

The statement regarding desirable activities for the 12-15 year old group was largely reiterated in 1968 in a policy statement by A.A.P.H.E.R.[2], this time specifically

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[1] Division of Men's Athletics A.A.H.P.E.R. "Athletics in Education", Journal of Health Physical Education and Recreation, 33:9 (September 1962), p.25.

[2] A.A.H.P.E.R. "Desirable Athletic Competition for Children of Elementary School Age", Washington A.A.H.P.E.R., 1968, p.vii.

with regard to boys up to the age of 12 years in which it was recognised that competitive sports organised by school or community agencies were now being played in all parts of the United States by boys of this age.

The cathartic value of sport had been referred to by Pickford[1] some twenty years earlier. He suggested that group games and sports are of value because "they show us the constructive use of aggressive and destructive impulses in group and individual". Lorenz[2] suggested that the ancient Greeks were familiar with the conception of catharsis, stated that the main function of sport today is the cathartic discharge of aggressive urge. He believes that sport educates man to a conscious and responsible control of his own fighting behaviour and continued:

> "More valuable still is the educational value of the restrictions imposed by the demands for fairness and chivalry which must be respected even in the face of the strongest aggression - eliciting stimuli."

Official pronouncement on competition for school children in Britain has been guarded. It was not until 1920 that any Board of Education publication[3] mentioned competition. Here it recognised the natural desire of the child to compete with his fellows, gave stress to the team and not the individual child being the competing unit and

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[1] R.W.Pickford, "Aspects of the Psychology of Games and Sports", British Journal of Psychology, (April 1941), p.282.

[2] Lorenz, Op.cit., pp.241-242.

[3] Board of Education, Suggestions in Regard to Games, London, H.M.S.O., 1920, p.8.

stated "The teacher should bear in mind the educational value of competition lies in cultivating the right spirit..."

By 1933 the Board of Education[1] were warning of dangers of competition when they stated:

> "Any tendency to employ adult methods of competition and to adopt adult standards of awards regardless of the effect they may have on a child's immature mind and personality must be avoided."

However it conceded that if correctly handled competition has a value and that opportunities should be provided for competitive inter and intra class games during normal school periods. Of the individual sports mentioned it recommended that in swimming, competitions for style and general skill were preferable to racing[2], and in athletics competitive work "must always be treated with caution when applied to school children of any age...."[3]

By 1937 the Board were less cautious in their pronouncement (the publication of that year was of course aimed at a population aged over 14 years). They stated that in swimming competitions could be arranged for those who were able to swim reasonably well provided the number of events per competitor was limited[4]. With regard to athletics they stated:

> "Indeed the very nature of athletic contests tends to emphasise individual responsibility, cultivates

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[1]Board of Education, Syllabus of Physical Training, London: H.M.S.O., 1933, p.41.

[2]Ibid, p.66.

[3]Ibid, p.68.

[4]Board of Education, Recreation and Physical Fitness for Youths and Men, London: H.M.S.O., 1937, p.195.

> self reliance and develops a sense of duty in regard to personal fitness."[1]

From the guarded recognition of competition by the educational authority in the twenties the position had been reached in the sixties where the government had, by implication at least, given support for competitive sport for school children up to international level. The evidence for this lies in the implementation of one of the recommendations of the Sports Council[2] that competitors representing their country in international sporting events should receive financial aid from public funds. This arrangement has been extended to schools' national teams.

Cautionary words regarding competitions continue to be heard. It is interesting to take note of a section of the Plowden Report - a report dealing with the education of children in England and Wales up to the age of 13 years. This section, considering the dangers of competition suggests that the achievement of some children may lead to their being introduced to techniques before they are ready for them, and to their being submitted to an adult conception of sport and personal performance. This section of the report concludes:

> "Competition clearly has a place, but it can be overdone and we think it sometimes is, in the form of inter school leagues and championships."[3]

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[1] Ibid., p.163.

[2] The Sports Council, A Report, London: H.M.S.O., 1966, p.9.

[3] Central Advisory Council for Education (England) Report, Children and their Primary Schools, H.M.S.O., 1967, p.259.

From the foregoing it is obvious that participation of boys in competitive sport has increased enormously in comparatively recent years. It is also obvious that there is a difference of opinion regarding both the value of and the effects of competition. It would appear that at present there is insufficient research evidence to warrant positive conclusions. There is no doubt that many educators and sports administrators are concerned about these possible effects. McIntosh[1] stated that some teachers are so afraid of competitive sport that they exclude it. He suggested, however, that this is not the solution. It is interesting to note that when the British Schools Judo Association held their first championships in 1965 the junior section was for Under 13 years. This was subsequently changed to Under 14, because it was felt that a National event was too much of an ordeal for boys of only 12 years and under.

The desirability of boys being heavily involved with fairly high level competition at an early age is clearly debatable. The problem was highlighted in Britain comparatively recently when Besford[2] pointed out the numerous activities in which children can compete and gain honours up to international level. She questioned whether some children may be too immature to handle the strain and glamour, citing a particular example of a ten year old chosen to

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[1] McIntosh, Op.cit., p.116.

[2] Pat Besford, "Dangers of Teenage Promise", World Sports 36:3, (March 1970), pp.43-45.

dive internationally for Britain and suggesting that similar stories could be told of many other sports. The question is whether regular involvement in competitive sport at a comparatively early age has any effect on personality development. The problem is investigated in this study through the competitive swimming environment.

Purpose of the Study

The purpose of this study is to investigate specific problems with regard to possible effects on the personality of boys 12-14 through regular participation in an intensely competitive sport.

The major problem to be investigated is to what extent and in what direction are there measurable changes in personality traits of boys regularly engaged in competitive sport as compared with boys who do not take part in competitive sport.

Subsidiary problems to be investigated are:-

1. Within the competitive group do those boys who are more successful demonstrate or develop personality traits differing from those boys who do not achieve success?
2. Do those competitors who drop out of the competitive scene differ in personality traits from those who remain?

It is contended that the results of the study would be a contribution to present knowledge of the effects of

participating in competitive sport on children and that those from the main problem to be investigated would be of value to education and sports administrators as an aid to making decisions on the desirability of the development of competitions for boys of this age. For instance the results could be of use to those teachers who are responsible for the development of physical education in the school curriculum. They could also provide a useful area of discussion in seminars with physical education students. Governing bodies of sports would have additional research findings on which to draw when considering the development of competitions similar to the A.S.A. Age Group Competition. The results of the subsidiary investigations would again be helpful to both education and to sports administrators, since if positive results occur, these could prove useful as a basis for comparison with other aspiring competitors to determine whether the latter had the necessary attributes to succeed in competition. In this respect a certain amount of counselling could be undertaken either to encourage the aspirant competitor or to persuade him to direct his energies into other pursuits.

CHAPTER II

REVIEW OF RELATED LITERATURE

In Chapter 2 consideration is given to the development of personality, in particular with respect to the influence that competitive sport may have on the personality. The first part of the chapter consists of discussion of theoretical reasons and experimental evidence which suggest that the competitive environment may in fact be a contributory factor to the way in which personalities develop, and is presented under the following sections:

The Development of Personality.

Sport as an Environmental Influence on Personality Development.

Studies of Emotional Response to Competition.

Anxiety in Sport.

Aggression in Sport.

Guilt Proneness.

Physical Discomfort in Sport.

Persistence in Sport.

The second part of the chapter consists of a review of studies which have specifically attempted to enquire into aspects of personality of participants, both school age and adult, in competitive sport. The sections under which these studies are reviewed are detailed on pages 63-64.

The Development of Personality

Unless one subscribes to a theiry of personality which is completely genetically based it would seem reasonable to hold the view that certain personality characteristics may be shaped to a considerable degree by environmental influences. Tibble[1] has suggested that emotions and personality traits are influenced more than perhaps we like to think of by conditioning, the result of learning in a specific social pattern. Support for this contention came from the results of a study by Cattell, Blewett and Beloff[2]. This study was a comparison of twelve primary personality traits measured by the Children's Personality Questionnaire administered to 104 identical twins, 64 fraternal twins, 182 siblings reared together, 72 unrelated children reared together, and 540 children living in the general population. The results were subjected to a multiple variance analysis and showed that three traits were predominantly hereditary in determination, in four traits hereditary and environment appeared to play an equal part and five traits were predominantly environmentally determined.

Murray[3] had earlier indicated that he considered

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[1] J.W.Tibble "Physical Education and the Educative Process", Studies in Education No.5, London, Evans Bros., 1952, p.17.

[2] R.B.Cattell, D.B.Blewett and J.R.Beloff, "The Inheritance of Personality, A Multiple Variance Analysis Determination of Approximate Nature-Nurture Ratios for Primary Personality Factors in Q Data", American Journal of Human Genetics, 7:2 (June 1955), pp.122-146.

[3] H.A.Murray et al, Explorations in Personality, Oxford, Oxford University Press, 1938, p.716.

environmental influences to be a factor in the shaping of personality when he stated that an effect of membership of a particular group may be to strengthen some personal tendencies and to weaken others.

Again it would seem reasonable to expect that environmental influences would be likely to have their greatest effect on personality development during the early formative years of life. Brunner[1] has suggested that if one accepts that position then it follows that if it is desirable to alter, or to influence, personality make up the best results would occur during childhood. The results of a study by Sealey and Cattell[2] indicate that there are changes in primary personality traits measured by the High School Personality Questionnaire (HSPQ) in boys aged 11-17 five of the changes being significant at .05 or above.

Sport as an Environmental Influence on Personality Development

The concept that competitive sport is one environmental influence which may be responsible for changes in personality has been pronounced by numerous writers ranging in background from Professors of Psychology to Olympic competitors. Ryan[3] stated that sport ".... provides an enormous area of interaction in which personality is vividly expressed and

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[1]B.C.Brunner, "Personality and Motivating Factors Influencing Adult Participation in Vigorous Physical Activity, Research Quarterly 40:3 (October 1969), p.469.

[2]A.P.Sealey and R.B.Cattell, "Adolescent Personality Trends in Primary Factors Measured on the 16PF and the HSPQ Questionnaires Through Ages 11-23," British Journal of Social and Clinical Psychology, 5, 1966.

[3]Francis J.Ryan "An Investigation of Personality Differences Associated with Competitive Ability", in Psychological Problems of College Men, ed. Bryant M.Wedge, New Haven, Yale University Press, 1958, p.113.

very possibly shaped". Slusher[1] suggested that sport, due to its very preoccupation with competition and combat encourages man to live with anxieties. One of the contributing countries to the UNESCO report on Sport in Education[2], considered that there was a danger of some pupils becoming too arrogant, demanding and less sociable following frequent participation in competition, success, and having extra attention given to them. In a study largely concerned with physical and physiological changes in competition Fait[3] gave some consideration to emotional factors which she considered have an effect on personality and suggested that the intensity of emotion engendered in athletic competitions has an effect on the attitudes and personalities of the participants. A change in degree of introversion through participation in sport was suggested by Cagigal[4] who stated:

> "A healthy practice of sport, or of pre-sporting activities initiated in childhood can dissipate many introspective habits, and prevent the formation of others."

A similar view has also been expressed quite recently by La Cava[5].

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[1]Howard Slusher, Man, Sport and Existence, London, Kimpton, 1967, p.192.

[2]UNESCO "The Place of Sport in Education", Paris, UNESCO, 1956, p.37.

[3]Hollis Francis Fait, "An Analytical Study of the Effects of Competitive Athletics Upon Junior High School Boys", Microcarded Ph.D. Thesis, Iowa State University, 1951, p.93.

[4]Jose Maria Cagigal, "Personality and Sport", Proceedings 7th International Congress on Health, Physical Education and Recreation, Washington, 1965, p.92.

[5]G.La Cava, "Sport as a Factor in the Formation of the Complete Modern Man", Journal of Sports Medicine and Physical Fitness, 10:1 (March 1970) p.3.

Ogilvie[1] referring to a cross sectional analysis of age group swimmers' personalities stated that there is a strong suggestion that positive changes occur with time but that he was unable to say, until longitudinal results became available, whether these may be due to attenuation of the population as the less emotionally stable drop away, but continued: "It is entirely possible that competition has contributed to the observed changes". Discussing the value of sporting competition Ogilvie and Tutko[2] consider such competition as a means through which an individual gains certain satisfactions which will ultimately lead to self enhancement with the intrinsic value derived having an ego integrating effect. Steve Clark[3] an Olympic gold medallist in swimming considers that the necessary traits of concentration, drive and confidence are not necessarily natural gifts but can be learned through an effective long range swimming programme. Certainly there would appear to be some justification for believing that regular involvement in intensely competitive sporting situations may have an effect on the shaping of personality and attention will now be directed to some aspects of competitive sport which might contribute to such shaping.

Probably anyone who has ever taken part in, or been closely associated with, competitions in competitive sporting activities will undoubtedly subscribe to the view that there is a degree

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[1]Bruce C.Ogilvie, "What is an Athlete?" Journal of Health, Physical Education and Recreation, 38:6 (June 1967), p.48.

[2]B.C.Ogilvie and T.A.Tutko, Problem Athletes and how to Handle Them, London, Pelham Books, 1966, p.71.

[3]Steve Clark, Competitive Swimming as I see it, North Hollywood, Swimming World, 1967, p.142.

of nervous tension associated with competing. This is probably greatest in the individual sports where a competitor does not have the support of other competitors in a team. Misangyi[1] reviewing nervous tension at the start of competition states that reactions are broadly either calm, excitable, or competition fever, the latter being detrimental to good performances and experienced because of one or more reasons such as a realization of being out of form or lack of preparation, bad memories such as successive defeats, fear of competition or of competing before a large crowd, and feelings of responsibility with regard to his performance. Hemdry[2] reporting on interviews with the 30 best junior swimmers in Britain stated that the high incidence of nail biting (83.3%) seemed to suggest that stresses of some kind were being brought to bear on young competitive swimmers. The view that participants in competitive sport can be subject to psychological stress would seem tenable if one accepts the theory of psychological stress put forward by Lazarus and Opton[3] who state that analysis of such stress is distinguished by the intervening variable of threat, a state in which an individual anticipates harm, the latter being defined in motivational terms as the thwarting of important goals. They suggested

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[1] O.Misangyi, "Preliminary States at the Start", The Olympic Academy, 2, 1962, Athens Hellenic Olympic Committee, pp.158-161.

[2] Leo Hendry "Loughborough Report", Swimming Times XLIV:12 (December 1967) p.438.

[3] Richard S.Lazarus and Edward M.Opton, "The Study of Psychological Stress; A Summary of Theoretical Formulations and Experimental Findings" in Anxiety and Behaviour, ed. Charles D.Spielberger, London, Academy Press, 1966, pp.229 and 258-259.

"....it is likely that in the context of human experience, frustration of interpersonal and intrapersonal goals are as important as threats related to bodily harm, if not more so". In the competitive sport situation there is certainly threat to the realisation of goals, whether it be retaining or achieving championship status at the highest level or simply being a winner at a lower level.

Forbes Carlile[1] a physiologist who has also been coach to the Australian Olympic Swimming team and to the Dutch National Swimming team is another researcher who considers the competitive situation to be stressful. He has suggested that the swimmer who is emotionally well balanced with a minimum of psychic unrest will have an advantage over swimmers who are concerned not only with stresses of competition but with additional internalised stresses. This can best be understood within the context of the General Adaptation Syndrome propounded by Hans Selye. Selye[2] contends that the sum of all stressing agents has to be taken into account when considering the effect of stress on the organism, and that the body has a limited amount of adaptation energy to deal with stress. He recognises that the concept of adaptation energy is an abstraction since the form of the energy has not been positively identified, although many of the physiological reactions to stress have been isolated and identified in the course of his experimental work. Of the many stressors which

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[1]Forbes Carlile, On Swimming, London, Pelham Books, 1963, p.94.

[2]Hans Selye, The Stress of Life, New York, Longmans Green & Co., 1956, pp.52-66 and pp.109-124.

can affect the human organism Selye[1] states that mental tensions, frustrations, sense of insecurity and aimlessness are among the more important. Certainly the first three could well apply to competitive sports situations.

Studies of Emotional Response to Competition

A few studies have been undertaken which have attempted to measure the effects of sports participation on emotion. Emotion per se is difficult to assess other than by rating methods, researchers in this area therefore have to rely on measuring physiological changes which are associated with emotional disturbances. The principle measures used are pulse rate, blood pressure, blood sugar level, palmar perspiration, 17-Kesteroid count and eosinophil count.

Johnson[2] administered the first three of these tests plus a subjective scale of tension test to two university groups, footballers and wrestlers. The tests were given on five occasions, (1) 4-6 days before competition, (2) day before, (3) a few hours before, (4) immediately before, and (5) 15 minutes after the competition had finished. He found that in the case of the footballers there was little emotional build-up preceding the game until test 4, just before the contest. In contrast, with the wrestlers, there was a marked emotional build-up in anticipation of the match. Since American football and wrestling are both body contact sports one might interpret

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[1] Op.cit., p.299.

[2] Warren R.Johnson "A study of Emotion Revealed in Two Types of Athletic Sports Contest, Research Quarterly 20:1 (March 1948), p.76.

these results as portraying a marked difference in the emotional response to competition of sportsmen enjoying the support of fellow team members in competition and in those taking part in individual type contest. Johnson concluded: "It would be educationally significant if wrestling were to be a calculated means of teaching young men ways of handling such intense emotion in themselves."

In a second study Johnson[1] measured emotional response to a word association test on a psychogalvanometer. The subjects were 82 university representative in basketball, swimming, wrestling and ice hockey and 82 non athletes acting as controls. The sports group were tested within one hour before competition. The results indicated that the pre-contest situation of the sports tested was characterised by a tendency towards exaggerated psychogalvanic activity. The sports group were significantly more reactive to both types of critical word stimuli employed in the study, than were the controls who were under no known emotional stress.

Harmon and Johnson[2] applied three of the physiological tests previously mentioned to 42 members of the Boston University Football team, the tests being administered between 45-25 minutes prior to the commencement of each game during a football season. They found that there were significant (.01) differences from normal in pulse rate, systolic blood pressure

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[1]Warren R.Johnson "Psychogalvanic and Word Association Studies of Athletes", Research Quarterly 22:4 (December 1951), pp.427-433.

[2]J.M.Harmon and W.R.Johnson, The Emotional Reaction of College Athletes, Research Quarterly, 23:4 (December 1952) pp.391-397.

and galvanic skin response indicating that there was definite emotional disturbance just preceding each contest. Of the tests used they found that the galvanic skin test[1] gave the best indicating of pre-contest disturbance.

Two studies using school age subjects have been reported. Skubic[2] conducted an experiment to collect objective data regarding the effects on the emotions of boys 9 - 15 years of age playing in national, local and intra mural baseball. She applied the galvanic skin response test to the same subjects at three different times. (1) At the rest stage before the game. (2) After the game. (3) 1½ hours after the game. Her conclusions were that insofar as the test can be regarded as a valid measure of emotional excitation of boys, at this age the results indicated that the boys showed no greater emotional response to competition in national league baseball than in intra mural games. Hanson[3] measured heart-rate with a telemeter on ten Little League Baseball players several times during the course of a game. He found the greatest difference from normal when the players were taking strike and stated that every subject experienced this stress but some much more severely than others. He further stated that such stress is short lived but gave no indication of the actual duration of the increased heart-rate nor for the prior

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[1]For details of the Galvanic Skin Test see Appendix. p.416

[2]Elevera Skubic "Emotional Responses of Boys to Little League and Middle League Competitive Baseball", Research Quarterly 26:3 (October 1955), pp.342-352.

[3]Dale Hanson "Cardiac Response to Participation in Little League Baseball Competition as Determined by Telemetry", Research Quarterly 38:3 (October 1967), pp.384-388.

period to taking strike.

It would seem that these studies do give support to the belief that competitive situations do have an affect on the emotions of participants. Cattell[1] implied that the competitive situation is stressful when he stated:

> ".....there may be people around who have the physical potential to make even better Olympic records than those we have, but whose neurotic personalities would reduce them to nervous wrecks in training and competitive situations."

Anxiety in Sport

Whiting[2] has stated that minor nervous disorders akin to neuroses do manifest themselves occasionally and often recurrently in active sportsmen and suggested that one instance in which neurotic symptoms emerge is during the pre-competitive period culminating in immediate pre-race manifestation of neurotic behaviour. Tutko[3] who with his fellow psychologist Ogilvie has carried out extensive work with athletes and coaches, administering standard personality tests to a thousand coaches and ten thousand athletes during a seven year period, states quite categorically that few non-athletes face the same type of stress that an athlete faces. Anxiety created by having to demonstrate one's talent before a large group of people and pressure to win especially if crucial

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[1] Raymond B.Cattell, "Some Psychological Correlates of Physical Fitness and Physique", in Exercise and Fitness in the Modern World, Chicago, Athletic Institute, 1960, p.147.

[2] H.T.A.Whiting, "Behaviour Therapy and Sports Medicine", Physical Education, 57:171 (July 1965), pp.33-34.

[3] Thomas A.Tutko, "Some Clinical Aspects of Sports Psychology", Quest, 13 (January 1970), pp.12-17.

championship points are required are present in the competitive situation. He concludes ".....it is easy to see that athletic contests are a source of extreme anxiety". This is a view shared by Slusher[1] who stated: "As in most aspects of life anxiety is present in sport". Cattell[2] has postulated that anxiety is a function of uncertainty of reward and states that evidence strongly supports this. If one accepts this postulate then the competitive arena is certainly an environment where rewards are frequently very uncertain. It would follow then that anxiety is present in competitive sports situations.

In a study which sought to relate anxiety as a trait (measured by Cattell's 16PF) and anxiety state (measured by IPAT Anxiety scale) to performance in competitive sport Langer[3] administered these tests to 55 Utah State University Footballers, three hours before each game of a football season. The players performance was rated by coaches. Statistical analysis revealed only one significant factor which distinguished between the better and poorer performances. This factor had high loadings on five primary personality factors four of which loaded high on Anxiety. The direction of the loading indicated that the better players were of significantly less anxious disposition than the poorer players. He also found

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[1] Slusher, Op.cit., p.192.

[2] R.B.Cattell, "Anxiety and Motivation: Theory and Crucial Experiments" in Anxiety and Behaviour, ed. Charles D.Spielberger, London, Academic Press, 1966, p.59.

[3] P.Langer, Varsity Football Performance, Perceptual and Motor Skills 23, 1966, pp.1181-1188.

that the IPAT Anxiety state measure was always negatively related to game performance. A somewhat comparable study was undertaken by Lapman[1] who administered the IPAT 8 parallel Form Anxiety Test battery to 15 members of the University of Florida Swimming team on eight occasions: pre and post season and before each of six swimming matches. He found a negative correlation .360 between anxiety and performance measured by percentage time improvement. This latter measurement could be questioned however since a swimmer very fit at the beginning of a season might find difficulty in improving his times throughout the season. When he divided his groups into champions and non champions he found no difference in anxiety levels between the two (the number of subjects however was very small).

In a laboratory experiment Ryan and Lakie[2] as part of their study related anxiety to competitive performance. They divided a group of twenty-nine undergraduates into a low and a high anxious group on the basis of their scores on Taylor's Manifest Anxiety Scale. The experimental test was a perceptual motor skill involving a mirror ring peg. Each subject was given ten attempts in a non competitive situation and five attempts in a competitive situation. The results analysed by Mann Witney U test revealed that the low anxiety group significantly improved their performance compared to

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[1] James J.Lapman, "Anxiety and its Effect on the Performance of Competitive Swimmers", Swimming Technique, 4:4 (January 1968) pp.119-121.

[2] E.D.Ryan and W.L.Lakie "Competitive and Non Competitive Performance in Relation to Achievement Motive and Manifest Anxiety", Journal of Personality and Social Psychology 1:4 1965, pp.342-345.

the high anxious group. They concluded:

> "The more anxious individual appears to do well in a non competitive situation when he is not threatened or under pressure but when placed in competition his anxiety or fear of failure tends to interfere with performance."

The implication here would be that the competitor with relatively low anxiety would be likely to be the more successful. Grinkler[1] is one who has suggested that a moderate amount of anxiety is faciliative to performance but Izard and Tomkins[2] have argued that anxiety only facilitates defence or escape and that interest-excitement is the chief facilitator of performance.

The question really is whether constant association with anxiety states in competitive sports situations has any effect on anxiety as a trait. Spielberger[3] states that it is assumed that anxiety as a trait is a reflection of past experiences that in some way determine individual differences in anxiety proneness, the experiences having most effect probably being those of childhood. Wolpe[4] puts forward the concept that the commonest neurotic response is anxiety and that neurotic responses are established by simple conditioning.

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[1]Roy R.Grinkler, "The Psychosomatic Aspects of Anxiety", in Anxiety and Behaviour ed. Charles D.Spielberger, London, Academic Press, 1966, p.129.

[2]Carroll E.Izard and Silvan S.Tomkins, "Affect and Behaviour: Anxiety as a Negative Affect", Anxiety and Behaviour ed. Charles D.Spielberger, London, Academic Press, 1966, p.

[3]Charles D.Spielberger, ed. Anxiety and Behaviour, London, Academic Press, 1966, p.18.

[4]Joseph Wolpe, The Conditioning and Deconditioning of Neurotic Anxiety in Anxiety and Behaviour, ed. Charles D. Spielberger, London, Academic Press, 1966, pp.179 and 182.

If this is so then the anxiety traits of competitive sportsmen may well be heightened especially in the case of the introverted competitor since Eysenck[1,2] has linked introversion with ease of conditioning. Generally speaking increase in anxiety is not regarded as desirable. Grinkler[3] is one for instance who has asserted that an excessive degree of anxiety can lead to somatic disturbances. A contrary view could be taken that placing persons in anxiety provoking situations of competitive sport gives them an opportunity to learn how to sublimate anxiety, a facility which might carry over into other life situations. It could even be that in the competitive situation there are two contrasting factors in operation, the one which may have a tendency to heighten anxiety due to competitive pressures and the other reducing anxiety through the conditioning effect on the autonomic nervous system brought about by participation in vigorous physical activity. Cureton[4] has indeed put forward just such a view and presents research evidence based on joint work of the Physical Fitness Research and Experimental Psychology Laboratories at the University of Illinois, to support his

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[1] H.J.Eysenck, The Dynamics of Anxiety and Hysteria, London, Routledge & Kegan Paul, 1957, pp.114-115.

[2] Throughout this thesis several references are made to the work of Hans Jurgen Eysenck and of Sybil B.G.Eysenck. In order to avoid confusion the former will be referred to by surname only whilst the latter will be referred to by both Christian and surname.

[3] Grinkler, Op.cit., p.129.

[4] T.K.Cureton, "Improvement of Psychological States by Means of Exercise-Fitness Programmes", Journal Association of Physical and Mental Rehabilitation, 17:1 (Jane-Feb.1963) pp.14-17.

conclusion that physical activities and conditioning have beneficial effects not only on physiological functioning but also on psychological aspects, in particular with a reduction in anxiety.

Turning now from the pre-competitive environment to the contest itself the question has to be asked whether it is conceivable that repeated participation in the actual contests may have any repercussion on the personality of the competitor. A link between competition and aggression has been suggested by a number of writers and the literature pertaining to this will now be reviewed.

Aggression in Sport

Beisser[1] is one who leaves no doubt about his position on this issue when he states "Competition in sports requires that aggression be focused on the goal of victory." Scott[2] also considers sport to be a form of aggressive activity which can produce dangers to be avoided but also provides pleasures which can be enjoyed and suggests that for good mental health it is advantageous to develop some harmless and impersonal outlet for aggression such as a sporting activity. Goodhart and Chataway[3] also subscribe to this view, maintaining that for the participants, sports provide an effective, socially acceptable method of discharging aggression. They

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[1] Arnold R.Beisser, The Madness in Sports, New York, Appleton Century Crofts, 1967, p.159.

[2] J.P.Scott, Aggression, Chicago, University of Chicago Press, 1958, pp.2 and 129.

[3] Philip Goodhart and Christopher Chataway, War Without Weapons, London, W.H.Allen, 1968, p.141.

ask the question whether sport in fact develops rather than deflects aggressive tendencies and conclude that a subjective assessment would be that it does not, based on the fact that prominent athletes are a remarkably law abiding group, since there is a lack of evidence to the contrary.

Before one can really consider the relationship of aggression to sporting encounters it is necessary to give some consideration to the theoretical positions that are held regarding aggression and to enquire into just what is meant by the term itself. There is not in fact one simple theory of aggression nor one meaning of the term. Storr[1] sums up the situation when he states that there is considerable dispute whether aggression is inborn or a response to adverse external circumstances. His position is that there is a physiological mechanism of aggression which is instinctive and that provided the term aggression is not restricted to actual fighting then aggressive expression may be as necessary a part of being a human being as is sexual expression. Scott[2] summarising the causes of aggression suggests that there is no inner need for aggression independent of the environment and further suggests that there may be no general trait of aggressiveness but concludes:

> "....any human being has the capacity to develop a fair amount of aggressiveness, but that his need to express it will depend upon his training and the amount of stimulation in the environment."

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[1] Anthony Storr, Human Aggression, London, Penguin Press, 1968, pp.1 and 15.

[2] Scott, Op.cit., pp.130-131.

Dolland, Miller et al[1] had earlier presented aggression as being response to frustration, a position one might expect them to hold since at the time they were members of staff at the Institute of Human Relations at Yale University where integrated studies were conducted in psychology, psychiatry, sociology and anthropology. Hall and Lindzey[2] have pointed out that the theoretical underpinning for the group was provided by Hull. Dolland, Miller et al as exponents of stimulus-response theory presented agression in these terms. Berkowitz[3] after reviewing instinctive theories of aggression generally rejects them and states that studies indicate that man is not born with a drive to fight. He suggests that theoretically aggression can be reduced by decreasing the occurrence of frustrations.[4] However he does not fully accept the response to frustration theory of aggression since aggression can result from other causes such as through identification with another aggressive personality.[5] The Berkowitz concept of aggression is really synonymous with fighting[6] and Storr[7] suggested that such a view, to which, incidentally, he does not subscribe, is the reason which has

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[1] J.Dolland, N.E.Miller et al, Frustration and Aggression, Yale, Yale University Press, 1939, p.209.

[2] C.S.Hall and G.Lindzey, Theories of Personality, New York, Wiley, p.424.

[3] Leonard Berkowitz, Aggression: A Social Psychological Analysis, New York, McGraw Hill, 1962, pp.20-21.

[4] Ibid, p.25.

[5] Ibid, p.259.

[6] Ibid, p.49.

[7] Storr, Op.cit., p.50.

led liberal humanists to label all aggression as bad and to believe that if all frustration were removed there would be no aggression. Basically the opposed theories are those of aggression as an instinctive drive and aggression as a response to environmental pressures. Scott[1], basing his theory on studies of animal aggression, has attempted to draw the two together and pursues a multiple factor theory of aggression stating that such an approach eliminates theoretical controversies based on choosing between alternative single factor theories since they are embraced within the multiple factor theory.

If, then, one subscribes to an instinctive theory of aggression one would be likely to support the construct of catharsis, the performance of an aggressive act reducing the instigation to aggression. In this context participation in competitive sport could be regarded as being cathartic - a socially acceptable means of discharge of aggressive urge with possibly beneficial results. On the other hand if one subscribes to the environmentally determined theory of aggression then one would be likely to accept a circular construct of aggressive acts leading to repeated aggression and, as Berkowitz[2] has suggested, a strengthening of a person's habitual hostile tendencies:

> "While short term anger might subside after a display of aggression the long term disposition (aggressiveness habit) would not necessarily be weakened but might even be strengthened."

A small number of studies have been undertaken which

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[1] Scott, Op.cit., p.viii.

[2] Berkowitz, Op.cit., p.203-205.

have enquired into the relationship of aggression and competitive sport. Johnson and Hutton[1] administered the House-Tree-Person (HTP) projective test to study the effects of a combative sport on personality. They tested eight college wrestlers on three occasions: (1) before the college wrestling season; (2) 4-5 hours before the first match of the season; and (3) on the morning following the match. Their findings revealed that during the conditioning period prior to the first contest there were increased aggressive feelings, especially intrapunitive, and also increased neurotic signs. On the morning after the contest it was found that there was a return to approximately pre-wrestling season conditions except for considerably less aggressive feelings. They concluded that the subjects experienced something of a cathartic effect whether or not they won.

Husman[2] also studied aggression in college age sportsmen. His groups consisted of nine boxers, eight wrestlers and nine cross country runners with a control group of seventeen. The projective tests he used were the Rosenzweig Picture Frustration Study (Rosenzweig PF), Murray's Thematic Apperception Test (TAT), and a Sentence Completion Test. Of these the TAT was judged to be the best instrument for measuring aggression. The tests were administered on the

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[1] W.R.Johnson and B.C.Hutton, "Effects of a Combative Sport upon Personality as Measured by a Projective Test", Research Quarterly 26:1 (March 1955), pp.49-53.

[2] Buris F.Husman "Aggression in Boxers and Wrestlers as Measured by Projective Techniques", Research Quarterly 26:4 (December 1955), pp.421-425.

following occasions: pre, mid and post season, pre and post contest. Significant differences indicated that the boxers were the least aggressive of the groups and they tended to direct aggressive feelings in an intrapunitive manner. The cross country runner in contrast, tended to agress outwardly and, compared with the control group they were more extrapunitive, less impunitive and possessed more super ego than the control group. The TAT revealed a trend, that was not significant, of a tendency for aggression of the participant to increase over a season of competition. Husman suggested that the results supported both the cathartic and the circular theories of aggression. Berkowitz[1] commenting on these findings suggested that the boxers' aggressive behaviour during the match presumably made them feel anxious or guilty even though the aggression was socially sanctioned. The same author[2] after reviewing studies on catharsis, some of which were of aggression in sports situations whilst the majority were laboratory studies of provoked aggressive response, concluded:

> "In general there is no unequivocal evidence of a cathartic lessening in the strength of aggressive tendencies following the performance of hostile acts. Such a phenomenon may well exist but the studies that have been conducted to date have not been altogether convincing."

With regard to contests he states that there is no conclusive evidence one way or another as to the consequences

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[1] Berkowitz, Op.cit., p.204.

[2] Ibid., p.219.

of aggressive contests.[1]

The assertion of Storr[2] that aggression should not simply be regarded as an undesirable trait has already been mentioned. A number of writers have expressed similar sentiments. Antonelli[3] states that without aggression there would be no desire for sentimental conquests nor for social or economic development and suggests that deprived of aggression humanity would become an "enormous grey herd". Scott[4] also believes that there are situations where aggressiveness is both useful and desirable and Storr[5] was rather more specific when he stated that aggression was necessary for the development of a human being otherwise it was not possible to break the ties of dependency and achieve personal autonomy. Cameron[6] gave a specific example of the value of aggressiveness when he presented a case for developing a more aggressive approach in excessively passive persons in order that they should become more normally self assertive. He supported his argument with an analysis of nine case studies. Storr[7] probably most adequately summed

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[1] Ibid., p.204.

[2] Storr, loc.cit.

[3] Ferrucio Antonelli, "Aggression and Sport", The Journal of Sports Medicine and Physical Fitness, 9:2 (June 1969) p.125.

[4] Scott, Op.cit., p.129.

[5] Storr, Op.cit., p.50.

[6] D.E.Cameron, "The Conversion of Passivity into Normal Self Assertion", American Journal of Psychiatry, 108, 1951, pp.98-102,

[7] Storr, Op.cit., Introduction.

up the viewpoint of aggression having a value when he stated:

> "Without the aggressive, active side of his nature man would be even less able than he is to direct the course of his life or to influence the world around him."

Certainly with regard to competitive sport most coaches would expect an aggressive attitude or response from their performers during the actual contest. A research study which by implication lends support to this statement is that conducted by Fauquier[1] who carried out an observational type study of 42 aggressive delinquent boys and 41 submissive delinquent boys. Aggressiveness was determined by day to day observation and recording of misconduct which was suggestive of aggression. As a result of his observations he concluded that aggressive boys seemed to carry over into athletics many of their characteristic behaviour patterns. Their attitudes suggested that they preferred competitive group activities which satisfied their hyperactive and dominant seeking nature. They seemed more interested in winning, were less nervous and less easily discouraged than were submissive boys. The findings from this study cannot be directly related to a normal population (the experimental population being delinquent boys) but it is suggestive of the need for a degree of aggression for success in competitive sport.

The question with regard to aggressiveness in competitive sport and the development of personality really resolves into a question of whether the degree of aggressiveness in

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[1] William Fauquier, "The Attitudes of Aggressive and Submissive Boys Towards Athletics", Child Development 11 (June 1940), pp.115-125.

participants is increased, decreased or is unaffected by regular participation in sport. Reference has already been made to the statement by Berkowitz[1] that there is no conclusive evidence regarding the consequences of aggressive contests. It is not proposed that this particular enquiry shall be central to the present study. The foregoing has been presented as one feasible reason why competitive sport may be an influence in shaping personality.

Guilt Proneness

Allied to the consideration of aggression in sport is the concept put forward by several writers of guilt proneness which may occur in some competitions and which may be the cause of some competitors being consistent losers. Ryan[2] basing his evidence mainly on case studies suggests that poor competitors have a negative approach and are constantly fearful of error in technique. He suggests that this is not simply an inefficient learning approach but a symptom of an emotional inability to accept achievement. Beisser[3] states that the poor competitor fears competition most of the time and that this is due to feelings of guilt over displaying aggression towards opponents during the contest:

> ".....to win is in the unconscious, tantamount to destroying one's opponent."

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[1] Berkowitz, Op.cit., p.204.

[2] Francis J.Ryan, "Further Observations on Competitive Ability in Athletics" in Psychological Problems of College Men, ed. Bryant M.Wedge, New Haven, Yale University Press, 1958, pp.129-131.

[3] Beisser, Op.cit., pp.159-167.

Ogilvie and Tutko[1] also put forward this same viewpoint that feelings of guilt over beating opponents are developed by some athletes and those very sensitive to this internal conflict find relief by failing to win. Ogilvie[2] suggests:

> "These men tend to be reliving old childhood fears associated with childish forms of aggression. In a very real sense they have developed an over-scrupulous conscience with regard to hostile or aggressive feelings. These feelings are often deeply repressed in their personalities that defeating an opponent often results in feelings of depression rather than elation. Somehow they must punish themselves for allowing natural aggressive tendencies to be expressed in an overt form. In their social training their teachers or parents have conditioned them to equate anger, hostility, aggression or even dominance with being evil or bad."

This could be one reason why some persons are consistent winners and some consistent losers.

Physical Discomfort in Sport

In some sports, particularly in those of an individual nature such as athletics and swimming a competitor to be successful has to have the ability to extend his physical resources almost to the point of exhaustion. With regard to competitive swimming Arthur[3] basing his comments principally on his experience as a competitor and a coach stated:

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[1]Bruce C.Ogilvie and Thomas A.Tutko, Problem Athletes and How to Handle Them, London, Pelham Books, 1966, p.89.

[2]Bruce C.Ogilvie "The Unconscious Fear of Success", Quest, 10, (May 1968), p.37.

[3]Ransom J.Arthur "Psychological and Psychotherapeutic Aspects of Swim Coaching", Journal of Sports Medicine and Physical Fitness, 7:4, (December 1967) p.187.

> "the swimmer must have a stoic component to his character, a part of which welcomes the overcoming of pain to reach a goal."

Certainly in racing and in the necessary training for racing, a degree of discomfort is involved which could reasonably be described as pain, in fact in the popular press the term "pain barrier" is frequently used when racing experiences are being described. This ability to withstand the pain involved is probably increased through a graduated training programme but there is also sufficient research evidence to suggest that psychological differences are a reason why some persons are better able to withstand pain and hence in the case of competitive sportsmen, who would be more likely to remain in competition and to be successful, in other words another differentiating factor between winners and losers.

Petrie[1] has detailed a number of research studies which would appear to give substance to the theory that people differ from one another in the way they process their experience of sensory environment. She indicates that there are three main types which she classifies as reducers and augmenters, lying either side of moderates, all three being on a continuum. Her method of determination has been mainly through kinesthetic sensation although perception of noise and weight were also used and she states:

> "what is being measured kisesthetically seems to be but one aspect of the generalised tendency for the reducer to diminish the perception of stimulation and for the augmenter to enlarge it."[2]

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[1] Asenath Petrie, Individuality in Pain and Suffering, Chicago, University of Chicago Press, 1967, pp.153.

[2] Op.cit., pp.14-15.

Petrie[1] found that the greatest tolerance for pain is shown by the person who is perceptually reducing and suggests that this tolerance is due in part to his tendency to reduce the perceived intensity of stimuli. Poser[2] reported a study where a positive correlation of 0.53 was found between kinesthetic figural after effect and cutaneous pain tolerance and stated that the magnitude and direction of the correlation supported the early findings of Petrie. Further support for Petrie's theory has come from the results of a study by Ryan and Foster[3]. They administered tests of Time Judgement, Kinesthetic Figural After Effect and Pain Tolerance to three groups of twenty High School boys. The groups were Contact Athletes (Football and Wrestling); Non Contact Athletes (Golf, Tennis, Runners) and Non Athletes. They found that definite distinctions could be made between the three groups with significant (.01) differences on the tests. The contact athletes fitted the pattern of the reducer, the non athlete the augmenter and the non contact athlete came somewhere in between. Ryan and Foster[4] commented that whilst difference in pain tolerance could be explained simply by assuming that the athletes were more motivated to withstand pain, time estimation and

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[1] Op.cit., p.27.

[2] E.Poser, "Figural After Effect as a Personality Correlate", Proceedings of XVIth International Congress of Psychology, Amsterdam, North Holland Publishing Co., 1960, pp.748-749.

[3] E.D.Ryan and R.Foster, "Athletic Participation and Perceptual Augmentation and Reduction", Journal of Personality and Social Psychology, 6:4, 1967, pp.472-476.

[4] Loc.cit.

estimation of kinesthetically perceived size were less amenable to changes in motivation.

Ryan and Kovacic[1] gave sixty High School boys a Kinesthetic test and then gave a pain tolerance test to two groups of fifteen, those who had shown greatest kinesthetic reduction and those who had shown least reduction. They found that the pronounced reducers had significantly (.01) greater pain tolerance than the least reducers. With all sixty subjects they obtained a significant (.01) correlation between pain tolerance and degree of reduction.

Petrie[2] discussing the origins of perceptual modulation states that this is clearly not a conscious process and that it would appear that the Central Nervous System at some point in or above the brain stem must be involved. She states that from information currently available, a person's basic perceptual reaction pattern appears to be partly genetically determined but predisposition in one direction or the other can probably be greatly altered by environmental conditions. The suggestion would be then that the ability to withstand the pain experienced in some competitive sports would be amenable to training.

These views would seem to be similar to those expressed by Melzack[3] with regard to the perception of pain. He

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[1] E.D.Ryan and C.R.Kovacic, "Pain Tolerance and Athletic Participation", Perceptual and Motor Skills 22, 1966, pp.383-390.

[2] Petrie, Op.cit., pp.103-105.

[3] Ronald Melzack, "The Perception of Pain," Scientific American Reprint, February 1961, pp.3-8.

states that pain is not a fixed response to a hurtful stimulus but its perception is modified by past experience, by our expectations and by our culture. From the results of laboratory experiment and surgery Melzack has been able to trace the electrical impulses evoked by painful stimuli from the receptor nerve endings to the cortex. He states that electrical energy induced in the higher brain areas is capable of supressing or modifying the impulse from the receptors, such modification taking place during the course of transmission from the sensory fibres to the ascending spiral cord neurons. He speculates that the message modifying fibres provide the mechanism whereby higher brain activities such as memories, thoughts and emotions can modify sensory messages following stimulus, and if this is correct then we have a conceptual physiological model to account for the fact that psychological events play an essential role in determining the intensity of ultimate perceptual experience.

That there are in fact psychological factors involved in pain tolerance is suggested from the results of a study by Gelfand[1]. Using a thermal pain measure on two groups, one of twenty-four receiving permissive instruction and one of sixty receiving non permissive instruction he found there was no significant difference in pain threshhold but that pain tolerance was significantly (.01) greater in the case of the non permissive (motivated group). A similar

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[1] S.Gelfand, "The Relationship of Experimental Pain Tolerance to Pain Threshhold", Canadian Journal of Psychology 18, 1964, pp.36-42.

experiment was conducted by Wolff, Kransegor and Farr[1]. They administered a cutaneous electrical stimulation test to a group of 43 (27 male, 16 female) twice, the first time under permissive instruction and the second under non permissive instruction. They found no significant differences in pain threshhold but there was significantly (.001) more pain tolerance for the non permissive trial, these results supported Gelfand's findings.

The relationship between personality traits and perceptual qualities, in particular the perception of pain, has been investigated by several researchers. Petrie[2] conducted two studies investigating such possible relationships. In both cases she used the Maudsley Personality Inventory (MPI) to measure Extraversion and Neuroticism. In the first study with 65 subjects she found that those high on extraversion tolerated both experimental and clinical pain better than did those low on extraversion. In the second study with 38 subjects and using a kinesthetic test she found that perceptual reducers were significantly more extrovert than augmenters. In neither study were there any differences with regard to neuroticism. Lynn and Eysenck[3] administered the MPI, the Rotating Spiral After Effect Test (an objective

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[1]B.B.Wolff, N.A.Kramsegor and R.S.Farr, "Effect of Suggestion upon Experimental Pain Response Parameters", Perceptual and Motor Skills, 21, 1965, pp.675-683.

[2]Petrie, Op.cit., pp.34-35.

[3]R.Lynn and H.J.Eysenck, "Tolerance for Pain, Extraversion and Neuroticism", Perceptual and Motor Skills, 12, 1961, pp.161-162.

measure of Extraversion) and a thermal pain tolerance test to 30 university students and obtained a significant (.01) correlation of .69 between extraversion and pain tolerance. They also obtained a negative correlation of -.36 between neuroticism and pain tolerance. Sternbach[1] reviewing studies relating personality traits to pain tolerance concludes that the introverted and neurotic person has the least tolerance for pain:

> "It would seem that the quiet brooding anxious and resentful individual is the one who is most likely to have symptoms of pain and is least able to tolerate them."

The concept of the extraverted personality being better able to withstand pain is in line with Eysenck's[2] theory of cortical inhibition which links a quicker generation of reactive inhibition, stronger inhibitions and a slower dissipation of reactive inhibition with extraversion. Whiting[3], some years ago had suggested that the greater pain tolerance of the extravert would be an advantage to a competitor and on another occasion stated that whilst it was probably possible to learn to withstand pain this might be a difficult procedure for the introverted person.[4] The suggestion is then that other things being

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[1] Richard A.Sternbach, Pain, A Psychophysiological Analysis, London, Academic Press, 1968, p.72.

[2] H.J.Eysenck, "Cortical Inhibition, Figural After Effect and Theory of Personality", Journal of Abnormal and Social Psychology, 51, 1955, pp.94-106.

[3] H.T.A.Whiting, "Personality and the Athlete", A.A.A. Coaching Newsletter, 25, (Sept.-December 1963), p.2.

[4] H.T.A.Whiting, "Personality and Sports Medicine", Physical Education 56:168 (July 1964), p.34.

equal the extrovert has more change of success because he is better able to withstand the pain involved in hard competition.

Persistence in Sport

Preparation for competition can be very arduous and in some sports, again in particular those such as athletics and swimming, no matter how hard coaches try to make training programmes interesting, there is a great deal of repetitive work, and in subjecting himself to the routine and discipline a competitor requires a great deal of persistence. Laboratory experiments have linked persistence in physical tasks with the personality trait of extraversion. Costello and Eysenck[1] conducted an experiment with 72 children age 14 - 17 to enquire into the relationship of persistence to personality. The children were given the Junior Maudsley Personality Inventory (JMPI) as a measure of extraversion and of neuroticism. They were then tested for maximum grip strength with both right and left hands. Each subject was then asked to hold two-thirds of the mean strength of each hand for as long as possible. The results indicated that there were no differences with regard to neuroticism nor to sex but extroverts were significantly (.02) more persistent than introverts. Howarth[2] tested 309 subjects on the Maudsley

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[1] C.G.Costello and H.J.Eysenck, "Persistence, Personality and Motivation", Perceptual and Motor Skills, 12, 1961, pp.169-170.

[2] E.Howarth, "Some Laboratory Measures of Extroversion-Introversion", Perceptual and Motor Skills, 17, 1963, pp.55-60.

Personality Inventory and from the results took three groups: 20 Extroverts, 19 Intermediates and 19 Introverts, the groups being equated on neuroticism. He then administered eight objective tests including a test of persistence where the left leg is raised to a certain height and the time is taken for it to drop nine inches from that height. Again extroverts were found to be significantly (.05) more persistent in a task involving physical persistence. It would seem likely then that the extrovert would again be at an advantage in that he would be likely to be more persistent during the physical conditioning period of training.

From the foregoing review of some aspects of training, of the pre-contest period and of the contest itself there would appear to be reasonable grounds for believing that the personality of a competitor might well be shaped to some extent by the competitive environment, that there could be personality characteristics which would at any rate partially determine whether a competitor continues in his sport or drops out, and which might also be a contributing factor to whether or not the competitor is successful. There have been a number of studies, in addition to those already cited, which have attempted to enquire into the relationship of personality to sports participation and these will now be considered.

Review of Studies of the Personality of Participants in Competitive Sport

Numerous studies have been undertaken which have attempted to enquire whether or not participants in competitive sport display different personality characteristics to those who do not participate. Generalisations are difficult due to the fact that many different measures of personality assessment have been used and the classification of a competitor and non-competitor is also very varied. Various techniques have been used in the assessment of personality, notably projective tests, ratings and inventories. With the latter the position is further complicated by the multiplicity of instruments used, especially until about a decade ago. Since then the majority of researchers have used either the Minesota Multiphasic Personality Inventory (MMPI); the California Psychological Inventory (CPI); Cattell's 16 Personality Factor Questionnaire (16PF); and High School Questionnaire (HSPQ); The Maudsley Personality Inventory (MPI) and Junior Maudsley Personality Inventory (JMPI); the Eysenck Personality Inventory (EPI) and Junior Eysenck Personality Inventory (JEPI). The first four measure a number of primary personality factors plus higher order factors whilst the latter four measure higher order factors of neuroticism and extraversion/introversion. Details of these inventories appear in the appendix (pp. 398-414).

A few studies have been carried out with school children as subjects but the majority have adults, frequently college

undergraduates, as the sample population. Whilst the present study is concerned with children of school age it was considered valuable to review studies on adult populations in addition to those of school age groups in order to indicate what trends there are, if any, at both age ranges. Similarly this present study is concerned with competitors in an individual sport but again it has been decided to review studies that enquired into the characteristics of team game competitors as well as individual sport competitors so that comparisons could be made.

One very noticeable feature of the studies so far completed is that they are nearly all cross sectional in design and very few longitudinal studies have been reported. The studies are reviewed in some detail with regard to sample size and design since the present researcher considers that too frequently research findings are quoted in the literature without sufficient attention being given to recording just how many subjects are in the group(s) or precisely what comparisons are being made. Throughout, the term "significant" findings relates to the .05 level of confidence. Where a value greater than .05 is reported this is indicated by being placed in brackets, e.g. (.01).

In an attempt to make the review directly relevant the studies are reported as below:

1. School Age Subjects.
   (a) Studies relating sporting prowess to peer status.
   (b) Personality comparisons of competitors with non-competitors:

(i) Grouped competitors, i.e. sports not specified.

(ii) Team game competitors.

(iii) Competitors in individual sports.

2. Adult Subjects.

Personality Comparisons of Competitors with Non-Competitors.

(i) Grouped competitors.

(ii) Team game competitors.

(iii) Competitors in individual sports.

Studies of School Age Subjects

(a) Studies relating sporting prowess to peer status

Several studies have been conducted, the results of which suggest that children whose sporting ability is high are accorded a high peer status and are frequently above average in social adjustment.

Biddulph[1] used both an inventory, the California Test of Personality (CTP), and a rating by four teachers on six items of adjustment, to study the relationship between sports achievements and personal social adjustment of boys 15-18 years of age. Sports achievement was assessed by scores on a five item, motor ability test. The results of these tests on the 461 boys in the study were then classified as high and low. He found that the high ability group had a significantly (.01) higher score

[1] Lowell G.Biddulph, "Athletic Achievement and Personal Social Adjustment of High School Boys", Research Quarterly 25:1 (March 1954), pp.1-7.

on the Self-Adjustment scale of the CTP and also scored significantly (.01) higher on items of adjustment rated by teachers, than the low ability group. The high ability group listed more personal friends and were chosen more frequently by associates in work, play and social activities. This greater popularity was evidenced by a significantly (.01) higher mean of the group for the number of times chosen by others. He concluded that the results indicated clearly that the group ranking high in sports achievement demonstrated a significantly greater degree of personal and social adjustment than did the low ranking group.

With 233 children aged 11+ to 14+ in two Secondary Modern Schools in Yorkshire, Bull[1] studied the relationship between physique, motor ability and temperamental traits. He used a Height, Weight and Physique Index, four tests of motor capacity including the Iowa Brace Test, and, for assessment of temperament, used the peer rating device of Highfield. This device requires pupils to allocate their contemporaries to specified roles. From factor analysis of his results Bull showed that pupils with high motor ability were allocated to the more highly regarded roles by their peers, roles which the originator of the test had shown to be related to surgent temperamental types. A high level of motor ability is a prerequisite for success in most sports.

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[1]K.R.Bull, "An investigation into the Relationship between Physique, Motor Capacity and Certain Temperamental Traits", British Journal, Educational Psychology 28 (June 1958), pp.149-154.

McGraw and Tolbert[1] gave 438 Junior High School Boys a sociometric test based on the pupils' choice of fellow pupils best liked, and related this to general athletic ability measured by a four item Athletic Index, judgement ratings by fellow pupils and degree of participation in inter-school and intramural sports. Significant (.01) relationships were obtained between sociometric status and athletic ability at 13 years at 14 years and at 15 years of age.

Seymour[2] investigating behaviour characteristics of competitors in a nationally organised competition in the United States compared them with boys of the same age (10-12 years) who did not compete. He applied two ratings and two inventories to the 178 boys in the study at a three-month interval, at the beginning and end of the long summer vacation. The instruments used were the Science Research Associates Junior Inventory; Needs and Problems Inventory; Winnetka Sclae for Rating School Behaviour and Attitudes; and Ohio Social Acceptance Scale (Peer rating). He found no significant differences in adjustment, but from the results of the Ohio Scale he found conclusive evidence that boys who participate in sports competitions are accorded a higher level of social acceptance. He

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[1] L.W.McGraw and J.W.Tolbert, "Sociometric Status and Athletic Ability of Junior High School Boys", Research Quarterly 24:1 (March 1953), pp.72-80.

[2] Emergy W.Seymour, "Comparative Study of Certain Behaviour Characteristics of Participant and Non Participant Boys in Little League Baseball", Research Quarterly 27:3 (October 1956), pp.330-346.

concludes:

> "....it would seem prudent to exercise caution in ascribing with any degree of certainty behavioural changes whether desirable or undesirable to Little League Baseball or to any other comparable programme for youth."

This conclusion is obviously justifiable on the results of his study, a three month experimental period, however, appears to be extremely short.

With 76 twelve year old boys Greene[1] found a significant correlation between both a measure of strength (11 item cable tension test average) and a measure of motor ability (60 yard shuttle run and standing broad jump), with peer rating as measured by a sociometric questionnaire. Again both strength and motor ability are characteristics required by boys likely to be successful in sports.

Anderson[2] studied the personal adjustment and social status measures of competitive and non-competitive boys aged 10-15 years, the declared object being to provide information on children with different levels of sporting ability and not to determine the effects of competition. His subjects included 71 competitors and 37 non-competitors aged 10-12 years and 76 competitors and 63 non-competitors aged 13-15 years. His competitive group was sub-divided into outstanding players, average players and players not

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[1] Walter H.Greene, "Peer Status and Level of Aspiration of Boys as Related to their Maturity Physique, Structural and Motor Ability Characteristics", Microcarded Ed.D. Thesis, University of Oregon, 1964, p.113.

[2] Robert B.Anderson, "A Study of Personal Adjustment and Social Status Measures of Non-Participants and Athletic Groups of Boys 10-15 years", Microcarded Ed.D. Dissertation, University of Oregon, 1965, pp.113-115.

regular members of teams. He used a sociometric questionnaire with the younger age group and the Mental Health Analysis Inventory with the older group. He found that there were significant differences between the groups, particularly from analysis of the sociometric ratings. He concluded that successful competitors evidenced a higher level of peer status and social adjustment than did boys who had been less successful and had no experience of membership of inter school competitive teams.

Similar results with regard to the higher level of peer status accorded to competitors were obtained by Buhrman[1] in a study of 74 Athletes and 84 Non Athletes tested at 14 and 15 years. In this study socioeconomic background, and academic achievement measured by Grade Point Average at school entry were held constant. The results showed a significantly (.01) higher level of peer status in the case of the athletes at both ages. Peer status in this study was measured by the Cowell Personal Distance Ballot.

Reviewing over four hundred studies and writings on the influence of play upon social and emotional adjustment of children Fraleigh[2] concluded that such influence could

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[1]Hans G.Buhrman, "Longitudinal Study of the Relationship between Athletic Participation, Various Socio-Psychological Variables and Academic Achievement of Junior High School Boys", Microcarded Ph.D. Thesis, University of Oregon, 1968, pp.110-111.

[2]Warren P.Fraleigh, "The Influence of Play upon Social and Emotional Adjustment with Implication for Physical Education", Microcarded Ph.D. Dissertation, Ohio State University, 1955, p.154.

be both desirable and undesirable. Desirable, since skilful participation in play activities valued highly by peer culture, will lead generally to better adjustment, while unskilled performance may lead to feelings of inferiority and group rejection. He pointed out that generally the normal pattern of participation in play activities is towards increasingly more social and competitive play.

Clarke[1] summarizing a number of researches relating to social acceptance in childhood and adolescence, stated that physical prowess is pre-eminent in establishing prestige and this is an important factor in an individual's self confidence. He asserted "No other single factor means so much for a boy's social status among his peers as the ability to play well."[2]

After reporting a correlation of 0.40 between athletic results and peer rating in a study of 700 primary and secondary children aged 10-16 Takala[3] stated:

> "It has been shown in a great many studies that sports success is highly evaluated among adolescents. Therefore social popularity and leadership could be expected to be indirect consequences of higher achievements in sports activities. It can be expected that the social prestige would reinforce the development of corresponding personality characteristics."

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[1] H.Harrison Clarke, Application of Measurement to Health and Physical Education, 4th Ed., Englewood Cliffs, Prentice Hall Inc., 1967, p.293.

[2] Op.cit., p.291.

[3] Martti Takala, "Personality Characteristics of Trained School Children in International Research in Sport and Physical Education, ed. E.Jokl and E.Simon, Springfield, Charles C.Thomas, 1964, p.97.

There would seem then to be sound support for the contention that successful competitors at schoolboy level are likely to be highly regarded by their peers, to be socially well accepted and to be self confident and well adjusted. Whilst no studies appear to have been conducted which have specifically looked at the peer status and adjustment of boys who develop sporting prowess over a period of time it would appear likely that such boys would improve their level of peer rating as they become more successful, and possibly develop more self confidence in cases where this was previously lacking.

(b) Personality comparisons of competitors and non-competitors

(i) Grouped competitors

The present researcher considers that the competitive environment and pressures are likely to be different in sports of a team nature to those of an individual nature and research where the two types of activities are enquired into separately tend to be more meaningful. However a number of studies have been undertaken where the competitive group is one embracing participants from different, and occasionally unspecified, sports. Mainly comparisons have been made between "competitive" and "non-competitive" groups but in some, measures of physical potential for sports participation such as strength or motor ability have been the criterion measure.

Merriman[1] in his study of 808 boys aged 15-18 used the Phillips JCR Test for purposes of matching on motor ability. The upper 25% were classed as upper motor ability group, the lower 25% were classed as the lower motor ability group. He used the California Psychological Inventory as a measure of personality traits. When he compared competitors with non-competitors, matched in terms of motor ability, no significant differences were found on personality traits of the two groups at each age. A comparison of 58 fifteen-year old boys in the upper motor ability group with a similar number in the lower motor ability group revealed significant differences on the Social Presence (Sp) variable where the upper group had the higher mean, and on the Femininity (Fe) variable where the lower group had the higher mean. He suggested that the inference might be drawn that motor ability rather than participation in competition was a potent factor in the development of personality traits.

Using the same inventory to measure personality traits Schendel[2] in the part of his study which was concerned with comparison of school age competitors and non-competitors found that at fifteen years of age in the two groups of sixty boys there were significant differences favouring

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[1]John B.Merriman, "The Relationship of Personality Traits to Motor Ability", Microcarded Ph.D. Dissertation, University of Iowa, 1959, pp.34-55.

[2]Jack Schendel, "Psychological Differences Between Athletes and Non-Participants at Three Educational Levels", Research Quarterly 36:1 (March 1965), p.66.

the competitive group on eight traits, five of which were from class 1 of the scale: measures of poise, ascendency and self-assurance. The significant differences were in the following traits: Dominance (Do), Sociability (Sy), Self-Acceptance (Sa), Socialization (So) and Communality (Cm) - all at .01 level and in Capacity for Status (Cs) and Sense of Well Being (Wo). He concluded that the fifteen year old competitors possess: more qualities of leadership and social initiative, more qualities which lead to status, a greater sense of personal worth, more social maturity, are more sociable and more conventional and have less self-doubts. There were no significant differences in personality traits of competitors grouped into three ability groups. With the 18 year old groups (45 competitors and 60 non-competitors) three of the differences found in the fifteen year olds were again revealed. There were significant differences (.01) in Sociability (Sy), Self-Acceptance (Sa), Communality (Cm) and in Achievement via Conformance (Ac). Schendel concluded that the 18 year old competitors generally possess desirable personal social psychological characteristics to a greater extent than the non-competitors, being more sociable and conventional, possessing a greater sense of personal worth and more capable of achievement in situations where conformity is necessary.

Slusher[1] used the Minnesota Multiphasic Personality

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[1]H.S.Slusher, "Personality and Intelligence Characteristics of Selected High School Athletes and Non-Athletes", Research Quarterly 35:4 (December 1964), pp.539-545.

Inventory to compare personality characteristics of High School competitors and non-competitors. His competitive group were all of able performance since they were all lettermen (i.e. in the British context they had been awarded school colours). There were 100 competitors in each of baseball, basketball and football groups and 60 each in swimming and wrestling. Each group was compared with a non-competitive group of 100 consisting of boys who had never attempted to represent their school. The most relevant findings from this study were that each of the competitive groups was significantly lower on the Masculine/Feminine Interest (MF) scale suggesting that their interests were of a more masculine nature. All competitive groups except the swimmers were significantly higher on the Hypochondriasis (Hs) scale compared to the non-competitive group indicating that the competitors had more concern over their physical well being.

The finding in this study of the competitor's concern over his health is to some extent understandable. Injury or ill health is likely to interfere with participation and progress in the chosen sport of the competitors and such setbacks may not be kept in perspective by the competitors concerned. Indeed Williams[1] has commented:

> ".....the effect of injury on an athlete is much greater since it compromises his preparations, performance and aspirations to a much greater extent."

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[1] J.G.P.Williams, Medical Aspects of Sport and Physical Fitness, Oxford, Pergamon Press, 1965, p.37.

The finding in Slusher's[1] study that the swimmers were the only group not to show higher hypochondriacal tendencies might be explained by the fact that of the sports included in the study swimming was the only one where risk of actual physical injury through participation could be virtually ruled out.

A study which reported no significant differences between "competitors" and "non-competitors" was that conducted by Whittle[2]. He used the California Test of Personality in his study of the effects of physical education on aspects of physical, motor and personality development of twelve year old boys. Included in his study was a comparison of two groups, one of which competed in sports a great deal in out of school time, the other competed only a little in out of school time. No significant differences were found between the two groups on personality traits measured by the CTP. However, in a sense both groups could be regarded as competitors since his criteria for placement in the groups were that for the 'great deal' group the boys had to compete regularly as a member of three teams, those for the 'little' group had not to compete for more than one team. It would seem that a more discriminative criteria could have been used.

All the studies reviewed in the section classified as

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[1] Slusher, loc.cit.

[2] H.Douglas Whittle, "Effects of Elementary School Physical Education upon Aspects of Physical Motor and Personality Development", Research Quarterly, 23:2 (May 1961), pp.249-260.

grouped competitors have been conducted with American High School boys as subjects. If one discounts the last study due to somewhat dubious differentiation of competitive groups the others would be suggestive that there are differences in personality characteristics of competitors and non-competitors with the former tending towards greater sociability and self-assurance, having more masculine interests and more hypochondriacal tendencies. However as Merriman[1] pointed out it could be that physical ability could be of more influence than competitive participation.

(ii) Team game competitors

Attention is now given to studies of school age competitors who participate in team games. Three British studies are considered first.

Herbert[2] citing a study by Hardman in which he used Cattell's High School Personality Questionnaire (HSPQ) to study possible relationships between ability in sport and personality traits in Secondary Modern schoolboys, aged 13-14, reported that Games skill correlated significantly with Low Super Ego Strength - casualness - (G) and with Group Dependency (Q2) and at the .01 level with Surgency (F), Zeppia - group mindedness - (J) and with Extraversion.

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[1] Merriman, Loc.cit.

[2] F.Herbert, "The Influence of Personality and Games Ability upon Physical Skill Performed under Stress", Adv. Dip.Ed. Dissertation, University of Manchester, 1965, p.6.

Kane[1] studied the psychological correlates of physique and physical abilities. His subjects were 412 fourteen year old boys in Secondary Modern Schools in Lancashire and London. Physical abilities were measured as follows:: Motor Ability - JCR test; skills-ratings on soccer and on total games; strength-measures on dynamometric strength. The personality test used was the HSPQ. He found that the secondary order factor Extraversion was significantly correlated with motor ability, with soccer skill (.01) and with total games skill (.01), Surgency (F) was clearly associated with achievement in skills being significantly correlated with motor ability (.01), soccer skills (.001) and total games skills. Zeppia - Liking Group Action - (J) was significantly related to competitive skills achievement correlating with soccer skills and with total games skills (.01). These were also highly significant correlations between Harria - realism - (I) and motor ability (.01) soccer skills and total games skills (.01), and with strength (.01). Kane summarized his findings by pointing out that the highest physical-personality relationship found was between skills achievement and Surgency, and that there was a clear-cut relationship between skills achievement and Extraversion and Realism. The relationship with factor J, liking for Group Action, is probably what one would expect from team game players. Stressing the relationship between

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[1]John E.Kane, "Psychological Correlates of Physique and Physical Ability", in International Research in Sport and Physical Education, E.Jokl and E.Simon, Ed. Springfield, Charles C.Thomas, 1964, pp.85-94.

Extraversion and physical ability he stated "Presumably success in competitive skills is in some way an extension of extroverted personality". He hypothesised that a high level of physical ability favours extrovert development and that among those of high physical ability only those achieve high standards in competitive conditions who rate highly in Extraversion.

Herbert[1] used the HSPQ to measure personality traits in his study of 156 boys aged 12-15 years in a co-educational Grammar school when he investigated the influence of personality and games ability on physical skill performed in stressful situations. His findings supported several of those reported by Hardman and by Kane. His subjects were rated on games ability in soccer, in rugby, in cricket and in total games. Personality traits which correlated significantly with total games achievement and with each of the three games separately were Extraversion, Zeppia - liking Group Action - (J) and Confident Adequacy (O). Four other primary factors correlated significantly with total games achievement. These were Ego Strength (C), Surgency (F), Group Dependency (Q2) and Low Super Ego Strength (G). In this study only with the rugby achievement group was there a significant correlation with Harria - realism - (I), a relationship that had been a feature of Kane's[2] findings.

Attention has already been directed to some of Slusher's[3]

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[1]Herbert, Op.cit., pp.1-74.

[2]Kane, Op.cit., p.93.

[3]Slusher, Loc.cit.

findings with American school boys in the previous section (p. 72-73). Another American study where in fact no differences were found in personality traits between 45 fifteen to nineteen year old High School football players and the norms for their school and national norms on the Group Personality Projective Test (GPPT) and the Test of Social Insight (TSI) was conducted by Cassel and Childers.[1] They stated that the players' scores on the personality variables were characteristic of typical High School pupils.

As has already been pointed out drawing conclusions from studies which have used different measuring devices is difficult. However the three British studies reviewed have all used the HSPQ and revealed a certain measure of agreement which would indicate that successful team game players at schoolboy level are high on personality traits of Extraversion and Surgency (one of the highly loaded primary factors contributing to extraversion) and in Zeppia - a liking for group action. Whether these traits are heightened as a result of games participation or whether boys already having these traits are drawn towards activities of a team game nature it is not possible to determine from the studies reported since their design did not include such an investigation.

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[1]Russel Cassel and Richard Childers, "A Study of Certain Attributes of 45 High School Varsity Football Team Members by use of Psychological Test Scores", Journal of Educational Research, 57:2, 1963, pp.64-67.

(iii) Competitors in Individual Sports

Studies of personality characteristics of schoolboy participants in individual competitive sports reported here have all been made on schoolboys participating in either track and field athletics or swimming.

Whiting[1] reported a study on a large number of boys in a Comprehensive school. Using the Junior Maudsley Personality Inventory (JMPI) as a measure of neuroticism and of extraversion, he found that a comparison between norms for boys in the school and the scores of boys who competed at school, district and national level in athletics revealed no differences on the neuroticism scale but significantly higher extraversion on the part of the athletes.

Warburton and Kane[2] compared the 16PF profiles of outstanding young English Athletes, aged 16-20, with the profiles of the Olympic Champions reported by Heusner.[3] A comparison with mean scores revealed that the young athletes differed in Dominance (E), Surgency (F), Harria - realism (I) and Shrewdness (N). Referring to these young athletes they state "On second order Extraversion they were high like the Champions, but their Anxiety score approximated to the mean whereas the Champions were markedly low".

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[1] H.T.A.Whiting, "Personality and the Athlete", AAA Coaching Newsletter, 24 (May-August, 1963), pp.7-8.

[2] Frank W.Warburton and John E.Kane, "Personality Related to Sport and Physical Ability" in Readings in Physical Education, Ed. John E.Kane, London, P.E.A., 1966, p.77.

[3] William Heusner, "Personality Traits of Champion and Former Champion Athletes", Unpublished Research Study, University of Illinois, 1952.

There was a similarity co-efficient of .62. When these outstanding young athletes were re-grouped according to their events nearly all extreme Extroverts were throwers and sprinters. The middle distance runners were lowest on Extraversion. They suggested that these results may have reflected the particular demands of their events.

With 30 top class young swimmers Hendry[1] found that the group differed from the general population average in personality as measured by 16PF in four factors: Dominance (E), Surgency (F), Realism (I) and Shrewdness (N). A difference was also found on the second order factor of Anxiety which in the case of the group of swimmers was high. With another group of swimmers tested at the A.S.A. championships with 16PF, Hendry[2] again found that as a group they scored high on anxiety in particular the younger male swimmers who were significantly more anxious than the older male swimmers. With this group there was not the same high surgency that had been apparent in the earlier study, and which was a feature of the studies reported on team game players. Hendry and Whiting[3] made a comparative study of top junior swimmers attending an A.S.A. advanced

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[1] Leo Hendry, "Personality - The Coach and the Swimmer", Swimming Times, 43:12, (December 1966), p.428.

[2] L.B.Hendry, "Assessment of Personality Traits in the Coach-Swimmer Relationship and a Preliminary Examination of the Father Figure Stereotype", Research Quarterly, 39:3, (October 1968), pp.543-551.

[3] L.B.Hendry and H.T.A.Whiting, "Social and Psychological Trends in National Championship Calibre Junior Swimmers - A Three Year Replication Study", Journal of Sports Medicine and Physical Fitness, 8:4 (December 1968), pp.198-203.

training course in 1964 with another comparable group in 1967. The number of boys testéd was 15 in 1964, and they were tested on the Junior Maudsley Personality Inventory (JMPI). Compared to national norms the swimmers were found to be significantly more extrovert and less neurotic. However when the second group were tested with the Junior Eysenck Personality Inventory (JEPI) no significant differences were found on either neuroticism or extraversion scales. A wide range of scores for both dimensions were reported and they stated that:

> "There would not appear to be any one personality type, at least not at this age level and standard of competition, who is successful."

Rushall[1] also with a comparatively small group of good boy swimmers - 16 sixteen year old Americans - found a significant difference from normal only on intelligence (B) on the 16PF, and Newman[2] also with a small group of 21 American High School swimmers found that there was not a set of personality traits (as measured by the Thurstone Temperament Schedule) which would identify the better swimmers in the group.

To draw any clear conclusion from the results of studies of the personality structure of schoolboy competitors in individual sports is difficult. There would seem to be some evidence for supporting a statement that track and

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[1] Brent S.Rushall, "Preliminary Personality Work with Swimmers", British Swimming Coaches Bulletin, 44 (April 1967), p.9.

[2] Earl N.Newman, "Personality Traits of Faster and Slower Swimmers", Research Quarterly 39:4 (December 1968), p.1053.

field athletes tend to be extrovert - more particularly those participating in the "explosive" type of event. The picture with young swimmers is less clear but there is some evidence that Anxiety is high. There would appear to be some justification for Hendry and Whiting's[1] statement that there would not appear to be one personality type at this age who is successful.

Considering all the studies reported here of the relationship of sporting prowess and competitive participation to the personality of school age boys the indication would seem to be that such boys would be accorded high peer status, would be socially accepted and well adjusted. Compared with non-competitive type boys there is some evidence of greater sociability and self-assurance on the part of the competitive boys who may also have hypochondriacal tendencies. Those who participate in competitive team games tend to be more surgent and extrovert and to be group dependent. Surgency and extraversion could be regarded as a characteristic of track and field competitors also, particularly those who participate in explosive type events. Competitive swimmers at this age do not evidence markedly similar personality profiles, there is however some suggestion of anxiety being high.

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[1]Hendry and Whiting, Op.cit., p.201.

Studies of Adult Competitors

Personality Comparisons of Competitors with Non-Competitors

Studies enquiring into the personality characteristics of adult competitive sportsmen are reviewed under similar sections to those used in the review of studies comparing school age competitors with non-competitors.

(i) Grouped competitors

The early investigators into the difference of personality traits between sports competitors and non-competitors had to use a number of measuring instruments to cover the traits which they wished to investigate. For example, one of the first studies in this area was that of Sperling[1]. In order to measure sixteen personality factors he used five scales, Smith's Human Behaviour Inventory, Guilford's Introversion and Extraversion Scale, Allports's Ascendence - Submission Reaction Scale, Harper's Social Study and Allport and Vernon's Study of Values. The groups to which he administered this battery were 171 university competitors, 138 intermural competitors and 126 non-competitors. He found that there were no differences between the University and Intermural groups, but the mean scores of both these groups were significantly higher than the mean score of the control group on Personal Adjustment, Ascendence and Extraversion. When he compared ten separate

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[1]Abraham P.Sperling, "The Relationship between Personality Adjustment and Achievement in Physical Education Activities", Research Quarterly, 13:3, (October 1942), pp.351-363.

university teams with the total for the University group the swimmers were found to be significantly more extraverted. When he compared individual sports with team sports the only noticeable differences were that the individual sports group were more liberal and more theoretical. Finally comparison between two groups of University competitors differentiated on the number of seasons of competitive experience, showed the group having the greater experience to have significantly more favourable adjustment scores, to be more ascendent and more extraverted. Whether or not this latter finding should be taken at face value is doubtful since the obtained results could simply portray differences due to a longer period spent in the total University environment.

Booth[1] studied the personality traits of sportsmen by comparing 145 college sport competitors with 141 college non-competitors, using the traits measured by the MMPI as the basis of the study. He found that the competitors scored significantly lower on the Interest (I) variable, on Anxiety (A), and on Social Responsibility (Re). The results on the Dominance (Do) variable where the university competitors and final year non-competitors scored significantly higher than both freshmen competitors and freshmen non-competitors would seem, like the suggestion

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[1] E.J.Booth, Jr., "Personality Traits of Athletes", Microcarded Ph.D.Dissertation, University of Iowa, 1957, p.93.

made with regard to the previous study, to be related to the fact of being in the senior year at college rather than being related to whether a student was a sports competitor or not. The lower score of the competitors on the Interest and Social Responsibility variable could well be a reflection of what might be regarded as over involvement in their own sporting activities at the expense of other interests and group responsibilities.

Keogh[1] studied the relationship of motor ability and sports performance to personality traits. His subjects were 167 Pomona College students in their third and fourth years at college. He measured motor ability by means of the Larson motor ability test and personality variables by the California Psychological Inventory (CPI). His findings were directly contrary to the published results of previous research since he found no significant relationship between either motor ability or sports performance and the eighteen separate variables of the CPI. He stated that this indicated that generalisation concerning relation of personality characteristics to sports participation and non-participation needed to be limited to the specific type of group being studied.

Schendel[1] a few years later also compared psychological differences between competitors and non-competitors using the CPI. His results for college age men were quite the

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[1]Jack Keogh, "Relationship of Motor Ability and Athletic Participation to Certain Standardized Personality Measures", Research Quarterly, 30:4, (December 1959), pp.438-445.

[2]Schendel, Op.cit., pp.52-67.

reverse of those of Keogh. With groups of 45 competitors and 60 non-competitors Schendel found significant differences, all at the .01 level on eight scales, and all in favour of the non-competitors. These were capacity for status (Cs), Responsibility (Re), Tolerance (To), Achievement via Independence (Al), Intellectual Efficiency (Ie), Psychological Mindedness (Py), Flexibility (Fx) and Femininity (Fe). He stated that the results indicated that the non-competitors at university level possess desirable social psychological characteristics (as listed above) to a greater extent than senior university competitive sportsmen. Schendel's results on college age competitors are very different from those he obtained comparing groups of competitors and non-competitors in the same cross sectional study at the age of fifteen and eighteen reported on page 72 where the desirable traits were generally in favour of the competitive group. An explanation of this could be either the increased degree of intense competition at university level in the United States or a difference in composition of the groups. At university level the competitive group will include only those who were at the top of the competitive group at school. The need for a longitudinal study is fairly obvious.

Several years later Berger and Littlefield[1] hypothesised that differences in personality between athletes and non-athletes at University level as found, e.g. by Schendel[2]

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[1]Richard A.Berger and Donald H.Littlefield, "Comparison Between College Athletes and Non Athletes on Personality", Research Quarterly, 40:4 (December 1969), pp.663-665.

[2]Schendel, loc.cit.

may reflect primarily academic achievements. In order to put this hypothesis to the test they administered the California Psychological Inventory (CPI) and the Scholastic Aptitude Test (SAT) to three groups consisting of 43 outstanding college athletes, 49 non-outstanding college athletes and 49 college non-athletes. They found by analysis of variance significant (.01) differences both on SAT and on composite CPI between the three groups. The next stage was to equate the groups on SAT. In so doing there was some subject wastage and the groups now numbered 30 each. Analysis of variance on composite CPI and on individual items in CPI did not now reveal significant differences. They concluded that qualities measured by SAT may be positively related to some personality characteristics and that Schendel[1] might have obtained similar results at college level had scholastic achievement been controlled. There is no doubt that Berger and Littlefield have by implication made an important point that insufficient variables are held constant in many of the studies reported in the literature, a point which the present researcher fully supports. However there would seem to be a certain amount of confusion in their case, between scholastic aptitude and achievement.

The question of the control of variables had earlier been made by Lakie[2] in the conclusion of his study when he

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[1]Schendel, loc.cit.

[2]William L.Lakie, "Personality Characteristics of Certain Groups of Intercollegiate Athletes", Research Quarterly 33:4 (December 1962), pp.566-573.

pointed out a factor which might have to be taken into account when considering the results of studies of competitors and non-competitors which have been undertaken in a particular educational institution. This variable was that specific colleges may attract students of similar characteristics. He stated:

> "Thus it may be that unique groups found in this study and other similar studies may be persons of similar characteristics being attracted to or recruited for specific sports programmes."

He based this conclusion on the results of five scales from the Omnibus Personality Inventory given to five groups of sports competitors, two team sports and three individual, at four different colleges. He found that there were significant differences on three of the scales among sports groups within a college, but also on two of these scales differences were found between competitors in the same sports who were attending different colleges.

All the studies so far reviewed in this section on general competitors have been undertaken with American subjects. A final American study reviewed in this section is that undertaken by Werner[1] who studied the relationship of physical education and the development of leadership characteristics at the United States Military Academy. His subjects were cadets participating in various sports. Using Cattell's 16PF as his test he found that the top competitors in the Academy teams had personality profiles

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[1]Alfred C.Werner, "Physical Education and the Development of Leadership Characteristics at the United States Military Academy", Microcarded D.P.E. Dissertation, Springfield College, 1960, p.236.

high in Harria - realism (I) and in Group Dependency (Q2).

In a British study in which 16PF was also used to measure personality Kane[1] analysed by multiple correlation, canonical correlation and factor analysis the relationship between sports participation and personality. His subjects were 185 male students and he found that:

> "Sports participation and personality are significantly related in a meaningful way in that a high rating in sports participation is linked with low ergic tension (Q4), Dominance (E) and Group dependence (Q2)."

He found that second order factor extraversion had an even closer link with general athletic ability and gave the following interpretation:

> "Understandably involvement in competitive athletic games and sports is founded not only on the necessary physical abilities but also on the surgent venturesome and sociable traits of personality which support overt extrovert behaviour."

To summarize the studies in this section of the review where different measuring instruments have been used and composition of sports groups has mostly not been specified is difficult indeed. There is some evidence which would justify linking extraversion with competitive sportsmen and in the two studies where 16PF was used as the measuring instrument factor Q2 Group dependency was a significant differentiator between competitors and non-competitors in both studies. The discrepancy of results has been indicated and with regard to this, probably the only justifiable conclusion may be that insufficient attention has been given

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[1] J.E.Kane, "Personality in Relation to Physical Abilities and Physique", Ph.D. Thesis, University of London, 1968, pp.311-320.

to details of experimental design in order to hold constant as many variables as feasible and that this, linked with different tests and group composition makes the discrepancy in reported results not all that surprising.

(ii) Team Game Competitors

Four studies which have specifically enquired into the personality characteristics of team game players are reviewed in this section. Unfortunately only two of the four used the same measuring instrument (16PF). A fifth study which included top class competitors from both team games and individual sports also used 16PF. Two further studies which have compared team game and individual sports participants are also reported in this section.

In a study designed to determine whether specific personality traits were associated with success in professional baseball La Place[1] compared 49 players from the American and National Leagues with 64 players from Class D Minor Leagues using the Minnesota Multiphasic Personality Inventory (MMPI) for these comparisons. He found that the top class players scored significantly lower on Schizophrenia Sc (.01) and on Psychopathic deviate Pd (.025). He interpreted this as showing that the top class players were less apt to digress from accepted social mores. When he compared the results of the top class players with the norms for general population, he found that they scored significantly lower on Schizophrenia

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[1] John P.La Place, "Personality and its Relationship to Success in Professional Baseball", Research Quarterly 25:3 (October 1954), pp.313-319.

Sc (.02) and significantly higher on Depression D (.01), Hysteria Hy (.01) and Hypomania Ma (.01). He suggested that the top class players have therefore a greater tendency towards worrying, sensitivity and frankness, and that their high score on the hypomania scale revealed that they are individuals who are ambitious, vigorous and full of plans and are more likely to adjust to an occupation requiring individual aggression. The greater tendency towards worrying of these top class players could be a reflection of the fact that their relatively high standard of living is dependent on their retention of physical fitness and skill.

Havel[1] in a study of college basketball players used the Edwards Personal Preference Schedule, to measure fifteen personality variables. His groups were rather small, however, and consisted of 12 university basketball players, 12 players of the university junior basketball, and a control group of fifteen non-competitors. He found significant differences on three variables between the top competitive group and the non-competitors. These were on Endurance, Change and Heterosexuality. His interpretation of these results was that the top competitors were more reluctant to experience novelty and change in daily routine, and seemed less interested in gaining the approval of the opposite sex. They displayed greater willingness to persevere and work hard at a task when compared to non-competitors.

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[1]Richard C.Havel, "Personality Variables of College Basketball Players", College Physical Education Association 62nd Annual Proceedings, Washington D.C., A.A.H.P.E.R., 1959, pp.130-135.

In a study comparing successful and unsuccessful American University football teams on Cattell's 16PF Kroll and Petersen[1] found that when comparing obtained sten scores on the personality factors none reached 4 or 7 which would have indicated significant differences from normal. When a univariate F test was applied the only significant difference was Intelligence (B). However, when scrutinized through a multiple discriminant analysis and a maximum likelihood classification, significant differences were demonstrated. The factors with highest contribution to the derived discriminant function were Intelligence (B), Parmia (H), Confident Adequacy (O), and High Strength of Self-Sentiment (Q3). Consistently successful university teams would appear as a group to be brighter, more bold, confident and controlled than teams which were consistent losers.

This study was of particular interest since it was probably the first comparison of personality traits of sportsmen which utilised a multiple discriminant analysis as the statistical model in place of the previously more usual univariate F or t tests. A number of studies have since been undertaken which have followed this example.

Kane[2] compared three groups of British Soccer players using 16PF. The three groups consisted of 45 mature

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[1]Walter Kroll and Kay H.Petersen, "Personality Profiles of Collegiate Football Teams", Research Quarterly 36:4 (December 1965), pp.441-447.

[2]J.E.Kane, "Personality Description of Soccer Ability" in Research in Physical Education 1:1, J.Wyn Owen, Ed., London, 1966, pp.54-64.

professional English League, Division 1, players, 23 Amateur internationals and 100 young professional players age 16-19. Comparison of profiles of the groups with a profile of the general population revealed a deviation in the case of the mature professionals in that they were more Surgent (F) and Controlled (Q3) less Adventurous (H) and surprisingly, less Dominant (E). This latter, however, was the only difference to reach significance. Kane pointed out that the primary order factor scores supporting second order extraversion were all high with the surprising exception of factor E, Dominance. Primary factors supporting second order anxiety were low. He stated:

> "In general then these mature professional players exhibit the personality traits normally expected in the outstanding sportsman, those of stable extraversion."

The profiles of the amateur internationals in this study revealed that they were higher than the general public on Intelligence (B) and low on Parmia (H). The Bohemianism (M) score was also low. They differed mainly in being brighter and less adventurous. The young professionals differed significantly on Affectothymia (A) and Guilt Proneness (O) on which they were high, indicating that they were more sociable and less secure than the general population. This insecurity of the young professionals could be attributed to their being in the early years of a rather hazardous profession where many fail to succeed. They were also significantly low on Super Ego Strength (G) suggesting that they were less conscientious. In a factor analysis on the results of the young professionals 32% of

the variance was contributed by second order factors, Anxiety (low) and Extraversion (high).

Similarity coefficients were calculated and resulted as follows: Professionals/Young Professionals .77, Professionals/Amateurs .70, Amateur/Young Professionals .80. Kane concluded:

> "The similarity of the profiles had indicated the possibility of a personality type which might describe outstanding footballers in general. A discriminant analysis tested this hypothesis and the failure to find a function which would distinguish significantly between the groups supported this contention."

A study by Hardman[1] into personality differences between top class and less able competitors was particularly interesting because the top class competitors in twelve different sports were all British or English internationals. Although groups from different games were fairly small the overall groups consisted of 167 top class competitors and 144 less able competitors. He also used 16PF to measure sixteen primary personality factors and four second order factors. From his comparison of the two levels of competitors he stated that the consistent trend for less able competitors to show "negative" traits to a greater extent than the more able players suggested greater personal adjustment on the part of the top class competitor.[2] He found that top class competitors were significantly (.01) more intelligent (B), stable (C), self-assured (O),

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[1] K.Hardman, "The Personality Differences of Top Class Games Players and Players of Lesser Ability", M.Ed. Thesis, University of Manchester, 1968, pp.98.

[2] Ibid, p.82.

self-controlled (Q3) and less anxious and also significantly (.05) less tense and excitable (Q4). Comparison of team players with individual sport competitors at top level did not reveal any significant differences and he stated:

> "It may be however that the demands of competition at the international level are common to both individual and team sports and either attract or develop similar personality types."[1]

Differences were found between mean scores of different sports on several of the twenty variables and Hardman suggested that to average together the scores from all or several sports (as indeed has been done in the studies reported under the two sections of grouped competitors in this chapter), "serves only to perpetuate the myth of a games playing type".[2]

Two American studies had found some differences between competitors in team games and individual sports at a lower level of performance (University representatives). Booth[3] found that individual competitors scored higher on both Depression D and Psychosthemia (Pt) variables of MMPI, indicating a greater tendency to worry and lack of confidence, compared to team game competitors, and Chipman[4] found that participants in team sports were significantly more ascendent and sociable and less apt to be original thinkers

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[1] Ibid, p.71.

[2] Ibid, pp.3-4.

[3] Booth, Loc.cit.

[4] Leroy P.Chipman, "A Comparison of Participants and Non-Participants in Intercollegiate Athletics with respect to Selected Personality Traits", Microcarded D.P.E. Thesis, Springfield College, 1968, pp.67-69.

than individual sports participants. These were three of eight scales measured by the Gordon Personal Profile and the Gordon Personal Inventory. Description of the first two traits in the test manual[1] would appear to signify extroverted types.

As was the case with the studies of grouped competitors generalisation from these studies is not easy. Kane[2] has presented evidence that there might be a general soccer playing type of personality and Hardman[3] has shown that there are differences between different groups of sportsmen and has rejected the concept of a games playing type. Aspects of personality of better class team game players which do recur fairly frequently in the studies, even when different measuring instruments have been used are confidence, self-control, low anxiety and a degree of extraversion. These then are personality characteristics which one might expect to find displayed by groups of successful team game players.

(iii) Competitors in individual sports

A study which Heusner[4] conducted with 41 British and American former Olympic champions produced a profile of highly successful competitors which has been used as a basis for comparison in several other studies. He

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[1]Leonard J.Gordon, Manual 1963 Revision Gordon Personal Profile, New York, Harcourt Bruce and World Inc., 1963, p.3.

[2]Kane, loc.cit.

[3]Hardman, loc.cit.

[4]Heusner, loc.cit.

administered the 16PF to the champions and found that in comparison to norms for the test they scored high on Affectothymia (A), Ego strength (C), Dominance (E) and Confidence (O). The sten scores were 7.5, 7.6, 7.8 and 3.3 respectively compared to the norm mean score of 5.5. He concluded that these differences in primary factors indicated differences in secondary factors, high extraversion and low anxiety among the champions.

With twelve national champions or All Americans as subjects, Johnson, Hutton and Johnson[1] studied their personalities by having the results of two projective tests: Rorscharch and House-Tree-Person (HTP), assessed by two trained evaluators who had no contact with the athletes nor any knowledge of the specific nature of the study. They found that the champions were readily distinguishable as an exceptional group with both test norms and the personal experience of the evaluators. Johnson, Hutton and Johnson summarised the findings:

> "Although generalising from this small sample of champions would be unjustified certain personality patterns were surprisingly consistent throughout this particular group. The subjects extreme aggressiveness, anxiety and sufficient freedom from emotional controls to aggress freely under certain conditions coupled with a high level of aspiration - would suggest a strong need for competitive achievement. The evidence suggests that in these subjects being a champion was a matter of psychological necessity."

These investigators point out that they had no way of

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[1] W.R.Johnson, D.C.Hutton and G.B.Johnson, Personality Traits of Champion Athletes as Measured by Two Projective Tests, Rorscharch and HTP", Research Quarterly, 25:4, (December 1954).

knowing in what ways the personalities of the champion athletes had been influenced by years of sports competitions. Compared with Heusner's study the most noticeable difference in the level of anxiety. This might be attributable to the different means of assessment with possibly a different level of anxiety being assessed - anxiety state in the All Americans study as compared with anxiety trait in the case of the Olympic Champions. Another possibility might be summised from the title of Heusner's study, i.e. "Former" champions, perhaps no longer being subjected to competitive pressures whilst the All Americans may still have been very much engaged in competition. Possible reasons can only be suggested, the only certain statement is that the studies did differ on this aspect of personality.

Studies of competitors in specific individual sports will now be reviewed - track and field athletics, tennis, combative sports (wrestling, karate), and swimming.

Athletics

Cureton[1] reported the results of extensive physiological and psychological tests given to Dr.Roger Bannister shortly before and just after he became the first man to run a mile in a time less than four minutes. Using the Cattell 16PF Cureton stated that Bannister possessed certain important psychological characteristics, notably that he was extremely high on the Dominance (E) and Independence

[1]Thomas K.Cureton, "Relationship of Physical Fitness to Athletic Performance and Sports", Journal of American Medical Association, 162 (November 1956), pp.1139-1149.

of Spirit (J) and Surgency (F), his latter score being at the 80th percentile.

Crakes[1] made a number of anatomical, physiological and psychological comparisons between two small groups of distance runners. His top ability group consisted of six athletes who had run the mile in less than four minutes 17 seconds. Included in the group were athletes who subsequently represented the United States in international athletics. The low ability group consisted of five runners who had never recorded a time better than 4 minutes 17 seconds for the one mile run. Amongst the tests applied was the California Psychological Inventory. Using non parametric statistical methods Crakes found that the top group had significantly lower scores on Responsibility Re (.04) and on Socialization S (.03). He concluded that the better performers tended to be more impulsive in nature and less concerned with the effects of their actions on the persons about them than were the poorer performers.

Warburton and Kane[2] compared 16PF profiles of British Olympic track and field representatives with those of the Olympic Champions reported by Heusner[3]. They found that primary factors, Surgency (F) and to a lesser extent, Dominance (E) were important in distinguishing these athletes. They were significantly low on Anxiety compared

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[1]James G.Crakes, "The Anatomical Physiological and Psychological Differences between Distance Runners of Varying Abilities", Microcarded Ph.D. Dissertation, University of Oregon, 1960, p.86.

[2]Warburton and Kane, Op.cit., pp.61-89.

[3]Heusner, loc.cit.

to the mean of the general population. Compared to Olympic Champions the main difference was that the British team were less extraverted particularly on the primary factors Parmia (H) and Bohemianism (M). There was a relatively high coefficient of similarity (.69). Dimsdale[1] who administered the Eysenck Personality Inventory to 26 athletes ranging in ability from club to international standard reported that compared to test norms there was a preponderance of individuals with strong extrovert tendencies in the athletic group. It has already been suggested[2] that even track and field athletics may be too large a group to generalise on personality characteristics and a division into similar events as was done by Crakes[3] might produce more meaningful results.

Tennis

Knapp[4] administered the Maudsley Personality Inventory to a group of British Lawn Tennis players including 18 male players, all of whom were of high enough standard to have played in the Wimbledon Championships. She reported trends to higher extraversion and lower neuroticism than test norms, but the differences were not significant.

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[1]Alan Dimsdale, "Two Personality Dimensions of a Small Sample of British Athletes", Bulletin British Psychological Society, 21 (July 1968), p.172.

[2]Page 80.

[3]Crakes, loc.cit.

[4]B.Knapp, "The Personality of Lawn Tennis Players", Bulletin of British Psychological Society 18:61 (October 1965).

Kane and Callaghan[1] administered the 16PF to 15 of the top 20 male tennis players in the world. Compared to norms the tennis players were high on Affectothymia (A) and low on Parmia (H) and on Self-Sentiment (Q3). They suggested that this indicated that the players were outwardly easy going but possessed basic diffidence and apprehension. There was no tendency towards either extraversion or introversion but there was a clear tendency towards Anxiety. Further analysis revealed that the top three players had very low scores on Anxiety but a number of less consistent players had high scores. There is here some comparison with the Olympic champion, i.e. at the very top low anxiety is a feature. When these 15 top players were compared with 50 very good Tournament Players they were very similar on total personality with a similarity coefficient of 0.88. Means of second order Extraversion and Anxiety were also similar. On individual primary factors the Tournament Players were high on Surgency (F) and Tenseness (Q4). Kane and Callaghan[2] suggested that whilst high surgency is common among track and field athletes it would appear that the top tennis player needs to be closer to the population mean. With regard to the high tenseness of the Tournament players they stated that the indication was that many of these players had not developed the ego strength necessary to cope with the energy excitement generated in the game.

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[1] J.E.Kane and J.L.Callaghan, "Personality Traits in Tennis Players", British Lawn Tennis (July 1965), pp.18-19.

[2] Loc.cit.

A study of tennis champions by Olson[1] was interesting in that he made a comparison of all time great champions with near greats - the latter including several former Wimbledon champions. His approach was one of rating and assessment by leading tennis coaches at eleven American universities and by personal interviews. Analysing his findings by a method of content analysis he concluded that the supreme champions were extrovert and pragmatic with the near greats evidencing personality factors not diametrically opposed but different in degree - less pragmatic, less extrovert.

These studies would suggest that only at the highest level is high extraversion a feature of class tennis players and that in world class players anxiety trait is high except at the very top, and less surgency and less tenseness is a characteristic of the higher quality players compared to general tournament players.

Combative Sports

Using 16PF Kroll[2] compared three groups of amateur wrestlers graded as being superior, excellent and average in ability. The results were analysed by multiple discriminant analysis and no significant differences were found in total personality profiles between any of the

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[1]Edward Carl Olson, "Identification of Personality Differences Among Male Tennis Champions", Microcarded Ph.D. Thesis, Ohio State University, 1966, p.76.

[2]Walter Kroll, "Sixteen Personality Profiles of Collegiate Wrestlers, Research Quarterly, 30:1 (March 1967), pp.49-57.

groups. Comparison of primary factor scores with test norms revealed a departure from average on Realism (I) indicating toughness and masculinity on the part of the wrestlers.

The same investigator in conjunction with Carlson[1] conducted a similar study of three groups of college age karate participants, the groups being 17 advanced, 25 intermediate and 29 novice competitors. 16PF was again used to measure personality traits and when a multiple discriminant analysis was applied to the obtained scores no significant differences were revealed between criterion groups. Sten scores of primary factors fell within normal values and it was concluded that it was not possible to differentiate between personality profiles of groups of differing levels of proficiency of karate nor between the participants and the normal population.

The results of these two studies cast doubt on whether in fact college participants in combative sports do differ in personality from that of the general population or indeed whether there are personality factors differentiating between levels of ability. It could be that it is only when the competitive gap is greater, e.g. when comparisons are made between those who have reached international level and the ordinary club competitor that personality differences become apparent. However in a study of high level performers

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[1]Walter Kroll and B.Robert Carlson, "Discriminant Function and Hierarchial Grouping Analysis of Karate Participants' Personality Profiles", Research Quarterly, 38:3 (October 1967), pp.405-411.

- 23 wrestlers competing at the World Championships - Morgan[1] found that there were no significant differences between the scores of the group and the test norms for extraversion and neuroticism measured by the Eysenck Personality Inventory but he did find a significant correlation between extraversion and success in the championships.

Swimming

The final review of studies of the personality of adult sports competitors is made in the sport with which the experimental part of this present study is concerned - swimming.

Part of the study by Warburton and Kane[2] referred to earlier with regard to athletics, was devoted to an analysis of the personality of a group of British Olympic swimmers. Compared to the Olympic athletes the swimmers were found to be significantly higher on anxiety. This was traceable to low scoring on Ego Strength (C) and high scoring on Guilt Proneness (O). As a group they approximated to the general population mean on Extraversion although they were high on Surgency (F) and Self Sufficiency (Q2). Within the group some of the most successful swimmers showed overall introversion tendencies. Discussing these results Kane[3] suggested that the explanation may be in the

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[1]William P.Morgan, "Personality Characteristics of Wrestlers Participating in the World Championships", Journal of Sports Medicine and Physical Fitness 8:4 (December 1968), pp.212-216.

[2]Warburton and Kane, loc.cit.

[3]J.E.Kane, "The Personaltiy of the Competitive Swimmer", British Swimming Coaches Bulletin 38, (December 1965), pp.1-5.

development of intense subjectivity and constant self analysis that result from constant competitive crises. In such a situation the champion needs to be self reliant. 16PF factors M and Q2 which measure these dimensions contribute substantially to introversion. He suggested that all champions need to be high on Surgency (F), one of the primary factors contributing to second order extraversion. The higher mean Anxiety score of the male swimmers could have been due, he suggested, to the fact that they were fairly young and were not yet fully integrated emotionally, evidenced by a low Ego Strength (C) score which in turn affected the Anxiety rating.

Three other studies of the personality of Olympic swimmers have been reported. With members of the United States team, 21 non medalists and 6 gold medalists, to whom a series of psychological tests were administered including 16PF, Ogilvie and Tutko[1] found no significant differences when a comparison of primary and secondary factor scores was analysed by the Mann Witney U test.

Carlile and Carlile[2] compared the personality off the Australian Olympic Swimming Team on 16PF with norms for the test. Although comparisons of the complete team (16 male and 12 female) showed no significant difference

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[1]Bruce C.Ogilvie and Thomas A.Tutko, "A Psychological Profile of Olympic Champions: A Brief Look at Olympic Medalists", Proceedings of First International Congress of Sports Psychology, Ed., Ferrucio Antonelli, Rome, 1965, pp.201-203.

[2]Forbes Carlile and Ursula Carlile, "Physiological Studies of Australian Olympic Swimmers in Hard Training", Australian Journal of Physical Education 23, (October-November 1961), pp.33-34.

in results from normal population, when the older (over 19) male swimmers were taken as a criterion group they were found to differ from normal being high on Self Sufficiency (Q2) and on Self Sentiment (Q3) and low on Ergic Tension (Q4). They concluded:

> "The older male Australian swimmers showed evidence of being independent and self sufficient, showed a strong control of emotion and ranked low in nervous tension."

Hardman[1] with a small group of ten British Olympic swimmers compared them on 16PF with a similar number of less successful club swimmers. He found that the only significant difference was on second order Extraversion where the Olympic swimmers scored significantly (.02) higher. There is an apparent contrast with Warburton and Kane's[2] findings of an extraversion score close to the population mean in their study of the previous Olympic swimming squad. The difference reported by Hardman might have been because of a low mean score by the club swimmers. Comparing the swimmers with eleven other groups of international competitors Hardman found significant differences which indicated that the swimmers were more Dominant (E) than six other sports groups including athletics and cross country, more Surgent (F) than four other groups including cross country, more Adventurous (H) than eight others and more Group Dependent (Q2) than six others, including two team sports. This latter finding might appear a little surprising but it should be remembered that although events are mostly of

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[1] Hardman, Op.cit., p.56.

[2] Warburton and Kane, Loc.cit.

an individual nature most swimmers compete regularly as members of club teams and in addition to the competitive aspect most clubs undertake numerous social activities.

Another study of the personality of international swimmers was reported by Parsons[1]. These were Canadian swimmers who were considered for the Commonwealth Games team. Analysis by non parametric methods of the results of the scores of the male swimmers on 16PF revealed no significant differences when a group of six selected team members was compared with a group of ten swimmers who were not selected. This would seem to be a comparable result to that obtained by Ogilvie and Tutko with the American Olympic team suggesting that there is little difference personality-wise between groups of successful and very successful swimmers at the top level. This should not be interpreted as indicating that there are not individual differences within the groups however.

With male swimmers of championship calibre Hendry[2] applied the Junior Eysenck Personality Inventory (JEPI) to a group of 18 swimmers who were under sixteen years of age and the Eysenck Personality Inventory to a group of 26 who were over sixteen years of age. He found that extraversion scores were very close to the norms for the tests but the neuroticism scores of the swimmers were

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[1] David Roy Parsons, "Personality Traits of National Representative Swimmers", Microcarded M.P.E. Thesis, University of British Columbia, 1963, p.69.

[2] C.B.Hendry, "The Relationship between Sophistication of Body Concept and Eysenckian Personality Dimension in Certain Championship Calibre Swimmers", British Swimming Coaches Bulletin, 49 (December 1968), pp.14-23.

higher than the norms. These results would appear to be comparable to those reported by Warburton and Kane.[1]

Rushall[2] studying the personality of swimmers used Cattell's 16PF. With thirty-five adult males who had qualified for the national finals in the United States he found that they were significantly different from the mean on five factors. They were above on Intelligence (B), Dominance (E), Presmia - sensitive (I) and Bohemianism (M), and below on Self-Sentiment Formation (Q3). On the extraversion scale they were normal. A small group of place-getters at the national championships also differed from the mean on Dominance (E) and on Harria (I), but in this case in the negative direction, indicating that they were tough and realistic. He concluded that male competitive swimmers tend to develop individual self-centred personalities and the higher the standard of achievement the more independent and realistic the personality. Whether this was caused by competition or maturation had not been established.

The studies of championship class swimmers reported would seem to indicate that as a group there may be a tendency towards Anxiety. The majority of studies have found that extraversion scores are close to test norms although one of the primary factors Surgency (F) contributing to extraversion, recurrs in some of the studies.

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[1] Warburton and Kane, Loc.cit.

[2] Rushall, Op.cit., pp.7-15.

Summary

The difficulty of relating the various studies in which different personality inventories have been used has been commented on. There may be some improvement in the future in making such cross references. Cattell and Gibbons[1] have stated that they found eight common dimensions in the Guilford and Cattell Inventories and that mutual multiple regression coefficients could be set up which would yield tolerably efficient mutual estimations between the two scales. Also following statistical analyses by Cattell and Specht[2] of the relation of surface traits measured by the Minnesota Multiphasic Personality Inventory and source traits measured by Cattell's 16PF, Delhees and Cattell[3] have calculated beta weights in order to derive 16PF source traits from an individual's M.M.P.I. surface trait sources and vice versa. Provided raw scores were available future comparisons of studies which have used these inventories would become more meaningful if such a conversion of scores were made.

Several writers have attempted to summarise reported

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[1] R.B.Cattell and B.D.Gibbons, "Personality Factor Structure of the Combined Guilford and Cattell Personality Questionnaire", Journal Personality and Social Psychology, 9, 1968, pp.118.

[2] R.B.Cattell and L.Specht, "What Pathological Dimensions Lie Beyond the Normal Dimension of 16PF? A Comparison of MMPI and 16PF Factor Domain", Journal Consulting and Clinical Psychology, 33, 1969, pp.18-29.

[3] Karl H.Delhees and Raymond B.Cattell, "Obtaining 16PF Scores from M.M.P.I. and M.M.P.I. Scores from the 16PF", Journal of Projective Techniques and Personality Assessment 34:3 (June 1970), pp.251-255.

research and generalise on the personality of the competitive sportsman.

Ogilvie[1] was more categoric than most when he stated:

> "The male competitor is basically an emotionally healthy person who tends towards extraversion. He is tough minded, self assertive, self confident, with a high capacity to endure the stress of high level competition. He operates at a very low level of anxiety and can adjust his personal level of tension in a manner appropriate to the level of stress he is about to face."

Ogilvie also stated that as a competitor moves up the success ladder most of the traits are intensified.

Kane[2] summing up the then current state of knowledge suggested that research findings in general supported the notion that athletic ability goes with personality dimension of aggressiveness, dominance, drive, tough mindedness, confidence, lack of anxiety and emotional stability - the outgoing sociable behaviour of the extrovert. He pointed out however that this was a generalisation and particularly in the individual type sports some of the top sportsmen were not markedly extroverts. He suggested that at the top of the ability pyramid where individuals must in the last analysis go forward on their own to success it may well be that introverts are temperamentally more suited than extroverts.

Both Husman[3] and Singer[4] have pointed out that

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[1]Bruce C.Ogilvie, "What is an Athlete?" Journal of Health, Physical Education and Recreation 38:6 (June 1967), p.48.

[2]J.E.Kane, "Personality and Athletic Ability", Coaching Review 5:2 (September 1967), pp.1-2.

[3]Burris F.Husman, "Sport and Personality Dynamics", Annual Proceedings National Collegiate Physical Education Association, 1969, p.59.

[4]Robert N.Singer, "Personality and Sport", The Physical Educator 26:4 (December 1969).

the discrepancies in reported research on the personality of the competitor, both stating that such are undoubtedly due to instrumentation and methodological inaccuracies and have called for improved experimental design. Husman[1] whilst pointing out that there is disagreement over levels of anxiety and the ability of champions to control their emotions states that there is some basic agreement regarding personality traits of some athletic groups suggesting that they are, or have the need to be, more aggressive, have exceptional feelings of self assurance, and, in team sports, tend to be more extroverted.

Hendry[2] after reviewing some of the recent studies of the relationship of personality with sporting and scholastic success states that whilst it may be an over simplification of existing evidence:

> ".....there seems to be a relationship between achievement and success both scholastic and sporting, and stability with thrustful extraversion, particularly in adolescence."

Apart from the frequently mentioned differences in use of measuring instruments, of classification of groups and lack of control over a sufficient number of variables two other features are very evident in the studies reported in this chapter. The first is that the majority of studies have been of adult groups and the second is that very few attempts have been made at longitudinal

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[1] Husman, Op.cit., p.63.

[2] L.B.Hendry, "Some Notions in Personality and Sporting Ability: Certain Comparison with Scholastic Achievement", Quest, 13 (January 1970), p.64.

studies in this area, in other words the studies have enquired into whether personality differences do exist between competitors and non-competitors or between different levels of competitive success but have not attempted to discover if any such differences have been affected through participation in competitive sport or whether it is more simply a case that persons already possessing certain personality characteristics are drawn towards particular sporting pursuits.

One study that did look at the possibility of personality change was conducted by Kane[1]. In one section of a larger study he compared the profiles of 75 physical education specialists on 16PF at the beginning and end of their three year course at college. During the three years some of these students would be pursuing their own particular competitive interests in addition to their study of physical education. The profiles were analysed by a multiple discriminant analysis which did not result in a discriminant function between the two profiles. Kane stated:

> "There is no canonical variate which significantly discriminates between the 1964 personality profile and the 1967 personality profile of men specialists and it is concluded that no demonstrable change took place for the group as a whole, indicating (within the limits of the present investigation) that no general personality change is linked with long term involvement in physical activities, games and general athletics."

This study should be commended as one of the few attempts at a longitudinal analysis. However, it would perhaps be

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[1] J.E.Kane, "Personality in Relation to Physical Abilities and Physique", Ph.D. Thesis, University of London, 1968, p.329.

more reasonable to expect that personality characteristics would be more likely to be influenced by a competitive environment at a younger age, i.e. during the formative years of childhood and adolescence.

Commenting on this research and on a smaller study conducted by himself Dimsdale[1] suggested that the indication is that an individual's personality is shaped in the early years of childhood and later becomes more resistant to change. He recommended that longitudinal studies should be undertaken to clarify this.

The desirability of longitudinal studies has been emphasised by several writers.

Takala[2] pointed out that in fact very few studies are available in which some causal relationship between sports activity and personality have been analysed and that a conclusion can be drawn from cross sectional studies only on correlation between personality traits and motor ability scores or other corresponding data. He stated:

> "Longitudinal studies of experimental and control groups.....are required before the latent causal factors can be found. It seems possible to plan systematical and analytical studies in which the more transient and permanent personality changes or transfer effects due to physical training are examined....."

Cattell[3] had earlier stated that among research he would

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[1]Alan G.Dimsdale, "An investigation into the Personality Profiles of a Group of Physical Education Students", British Journal of Physical Education 1:3 (May 1970), p.

[2]Takala, loc.cit.

[3]Raymond B.Cattell, "Some Psychological Correlations of Physical Fitness and Physique", in Exercise and Fitness, Chicago, The Athletic Institute, 1960, p.147.

like to see were "personality tests and re-tests on experimental and control groups whilst the former are undergoing a long period of physical training."

More recently Faulkner[1] listing the research that he considered should be carried out stated:

> "Longitudinal studies on the effect of long-term swim programmes on the personality and other psychological characteristics of the participants are of the utmost importance."

This present study is an attempt to investigate whether involvement in a highly competitive swimming environment of three seasons duration has any measurable effect on the personality of boys aged twelve to fourteen years.

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[1] John A.Faulkner, What Research Tells the Coach about Swimming, Washington, D.C., A.A.H.P.E.R., 1967, p.30.

CHAPTER III

RESEARCH PROCEDURES

In Chapter 3 the procedures which were followed in the experimental part of this study are described. They are presented in the following sections:

Selection of Subjects.

Matching of Competitive and Control Groups.

The Assessment of Personality.

Selection of Method of Measurement.

Comparison of the Cattell and Eysenck Approach to Personality Measurement.

Collection of Data.

Analysis of Data.

Statistical Procedures Used.

Where appropiate the theoretical background and experimental evidence from previous studies which support the procedures followed in the present study, are included in the discussion.

Selection of Subjects.

Competitive Group

The subjects selected for the competitive group were boys who competed regularly as individual competitors in the nationally-organised Amateur Swimming Association Age Group Competition. The group included boys from the following

swimming clubs in the N.E. District of the A.S.A., that is, in the counties of Northumberland, Durham and Yorkshire: Barnsley Schools S.A., Bradford and District A.S.A., Bradford Grammar school, Consett, Darlington, Doncaster, Eston, Felling, Gateshead, Harrogate, Hartlepools, Halifax, Heaton, Huddersfield Baths, Huddersfield Schools S.A., Hull Olympic, Leeds Central, Middlesbrough, Skipton, Stanley, Sunderland, Whickham and York City.

The total competitive group comprised two sub-groups, Group A included boys who had competed in the competition as 11 year olds in the 1966 season, that is boys born in 1955, and who were competing in the 12 year old age group during the 1967 season, when they were first tested. This group was retested in 1968 and in 1969. Group B included boys who had competed as 11 year olds in 1967, that is boys born in 1956 and who were competing in the 12 year old age group during the 1968 period, when they were first tested. This group was retested in 1969 and 1970.

Approximately 90% of all the boys who competed as 12 year olds in 1967 and in 1968 in the N.E. District of the A.S.A. took part in the study. The strength of Age Group Competitive swimming in the district can be judged from the fact that the district team finished second of the five A.S.A. districts in the national championships in five successive years following the inception of the competition at national level. There appeared to be sound reasons for accepting that the boys taking part in the study were a fair sample of age group swimmers in England.

Age group swimmers were chosen as the competitive group for several reasons. In the first instance it was the considered judgement of the researcher that competitive swimming generally was both the most highly organised and intensively pursued sport at the age range being studied. This judgement was supported by each of several men prominent in the field of Physical Education and Recreation to whom the researcher had posed the question "In which sport do you consider that boys aged 11-14 are under the most intenstive competition?" In addition, swimming is the only sport where large numbers of boys take part in regular individual competition at the age of twelve and below. Finally since age group swimming programmes exist in many countries it might prove possible for cross reference to take place should similar studies be undertaken in other countries.

The 'competitiveness' of the boys in the study can be gauged from the number of races swum and the amount of training undertaken. These of course vary within the group but typical are competitors numbers 11A, 18A, 19A, 36A, 40A and 70A whose coaches listed twenty galas per season and training four to five evenings a week for one hour each session. Some recorded more than this and number 61A recorded thirty-five galas not taking account of school events, and training six days a week for $1\frac{1}{2}$ hours each. All these statistics refer to swimmers when they were competing as 12 year olds.

The age range being studied is from 11+ to 14+, that is

boys competing as 12 year olds, 13 year olds and 14 year olds, corresponding in terms of school age to the upper end of Primary school and the first three years of Secondary school. There were reasons for the choice of this age range. In the first instance it represents the age over which much controversy has taken place with regard to the desirability of competition. When the study was being planned the youngest age group competing at national level was 11 years. By taking the group who had competed at 11 years and testing them when they were competing as 12 year olds there was some evidence that these subjects may be likely to stay in competition during the period of the study, thus reducing the likelihood of subject wastage. 12 year old boys was a practical proposition with regard to the testing of boys in the control group since they could be tested in their first year of secondary school, thus eliminating the difficulty of trying to follow through boys from Primary school once they had transferred to different secondary schools. By completing the study when boys are at the end of their third year in secondary school, testing is completed before the boys are subject to pressures due to final preparation for, and taking of, national examinations such as G.C.E. and C.S.E.

The age range being studied does of course coincide with the onset of puberty and the adolescent period, a period during which studies have shown that temperamental changes do take place. Norms of the Junior Eysenck Personality

Inventory[1] illustrate an increase in the scores for extraversion for boys in this age range particularly from the age of 12 years to 13 years. In contrast the scores for neuroticism are fairly constant. Banik[2] reviewing theories of adolescence propounded by Sherif and Cantril, Snygg and Combs, Symonds and Ausubel stated that adolescence, which he defined as 10-16, could be described as a period of transition in the bio-social status of the individual. He continued:

> "It is a period when marked changes take place in duties, privileges, status, social and economic roles and relations with others. It indicates the beginning of the assumption of the adult biological and social sex role. It is a period when the individual is confronted with a new set of social demands and expectations. Under such conditions changes in attitudes towards self, parents authority and peers are sure to occur. New aspirations are generated, new standards of behaviour are constituted and new ways of learning are being adopted. In short adolescence can be viewed as a period of extensive personality reorganisation or 'ego reorganisation'.

In Banik's[3] cross sectional study of frustration and aggression of 456 boys aged 10-16 the Rosenzweig Picture Frustration Study and a specially constructed questionnaire were used as the measuring instruments. It was found that amounts of frustration and aggression varied as between age groups and both reached their highest levels in 13 year old

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[1] Sybil B.G.Eysenck, Manual of the Junior Eysenck Personality Inventory, London, University of London Press, 1966, pp.6-7.

[2] S.N.Banik, "A Study of Frustration and Aggression in Adolescent Boys", Ph.D. Thesis, University of Bristol, 1964, p.16.

[3] Ibid, p.167.

boys and fell to lower levels among the older boys.

Nesbitt[1] investigated the development of character integration in children aged 9-14 years. He considered character to be an aspect of personality defining it as ".....an acquired organisation of orectic elements in personality resulting in consistency of willed or voluntary action". From the results of his study of 420 children in three groups, $9\frac{1}{2}$-$10\frac{1}{2}$, $11\frac{1}{2}$-$12\frac{1}{2}$, $13\frac{1}{2}$-$14\frac{1}{2}$, Nesbitt[2] concluded his research had given limited support to the proposition that as they grow older children show greater consistency of conduct and have increasing integration of character. He suggested that such change occurs as a result of environmental influence which may be nothing more than the urges to conformity present in the community which become more effective the longer they are at work.

Accepting that change in personality was likely to occur during the age span of the boys in the study the object was to determine whether there were differences in such changes between the competitive group and a control group, and whether the changes were in the same direction as other studies suggest.

Control Group

In number the control group equalled that of the competitive group since each member of the latter was matched

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[1] J.E.Nesbitt, "The Development of Character Integration in Children Aged from Nine to Fourteen Years", Ph.D. Thesis, University of Manchester, 1962, p.17.

[2] Ibid, pp.167-169.

with a boy in the control group. The group consisted of boys who, whilst taking part in a normal physical education programme in schools, did not take part in individual competitive sports. The boys in the control group were from the following schools: Bede Hall, Billingham; Brinkburn County Secondary, South Shields; Chuter Ede Secondary, South Shields; Davy Hall, Billingham; Durham Johnston Grammar; Adwick School, Doncaster; Salendine Nook, Huddersfield; and Shildon Sunnydale Secondary.

For the control group to match with competitors 686 subjects were tested. From these were selected boys who most closely matched boys in the competitive group.

Since a large number of subjects were required for matching purposes it was obviously necessary to draw subjects from several schools. Furthermore it was considered sound experimental procedure to do so. Studies where interviews or questionnaires have been utilised with subjects drawn from a single institution have been subject to criticism. Shipman[1] for instance has criticised investigators in such a situation for ignoring environmental influences on individual response and suggested that generalisations may be impossible if the results of a research study reflect the social system or pressures of a single institution.

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[1] M.D.Shipman, "Environmental Influences on Response to Questionnaires", British Journal of Educational Psychology 37,1 (February 1967), pp.54-57.

Elimination of Subjects from the Groups

Since the reliability of response by the subjects to personality questionnaires was essential all boys who scored above four on the lie scale of Junior Eysenck Personality Inventory were eliminated. The lie scale norm for 11 year old boys on this test is 4.792. The scale is designed to measure the tendency of children to distort their test responses by claiming an unlikely degree of moral perfection. Commenting on the interpretation of a lie scale in an instrument comparable to that used in this study Gibson[1] postulated that every lie score could represent either deliberate misrepresentation of the facts about known self or truthful report of unusually good behaviour. Thus there was the possibility that some subjects eliminated in this process may have been unusually well-behaved boys. Such wastage was considered to be worthwhile in the interests of obtaining reliable test responses from the groups.

Number of Subjects in the Groups

Competitive Group

The A group initially numbered 72 of whom 54 remained in the study to the age of 14 years. The B group initially numbered 69 of whom 52 remained in the study to the age of 14 years. The total competitive group (T), therefore

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[1] H.B.Gibson, "A lie scale for the Junior Maudsley Personality Inventory", British Journal of Educational Psychology, 34, 1964, p.121.

numbered 106.[1]

Control Group

The control group equalled the competitive group in numbers, i.e. 106. Reserve controls were brought into the study to replace original controls who fell out of the study, usually due to moving to a different area.

Successful Competitive Group

This group comprised those boys who had either been placed in the first three in a county championship and/or had reached the final of a N.E. District championship, and was 35 in number. Included in this group were five boys who had reached the final in their event in the National Age Group Championships and/or English Schools Swimming Association Championships, two of whom were national champions at their age.

Unsuccessful Competitive Group

This group comparable in number to the successful group, i.e. 35, consisted of boys who had the slowest times of the group of boys who had never reached a county or district final.

Competitive Drop Out Group

Of the 35 competitors who did not complete the three annual tests seven had moved away from the N.E., two had given up swimming on medical advice (perforated ear drums) which meant that there were 26 subjects who were classified

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[1]The procedure of adding together two or more sub groups into a total group is a recognised procedure in educational research. It has been used for instance in the compilation norm tables for the Junior Eysenck Personality Inventory and in the Longitudinal Medford Growth Study.

as competitive drop outs.

Matching of Competitive and Control Groups

Each boy from the competitive group was matched with a boy from the control group in terms of chronological and mental age, social background and physical capacity.

Chronological Age

The procedure adopted was comparable to that used in the Medford Growth Study[1] where reasonable homogenity of groups in terms of chronological age was considered to have been obtained when the subjects in a group were born within a four-month span. In this present study each boy in the competitive group was matched with a control who had not more than four months difference in his date of birth.

Mental Age

Mental age was considered to be matched when there was not a greater difference than four months between a competitive subject and his control. This was obtained by a comparison of scores on the Mental Ability Test[2] used, a difference of not more than two points indicated that there was not more than four months difference in mental age.

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[1] H.Harrison Clarke, "The Medford Oregon Boys Growth Study, Initial Contributions and Implications", Curriculum Bulletin, 238:XIX, November 1968, ed. Hugh B.Wood, Eugene, School of Education, University of Oregon, p.1.

[2] Arthur S.Otis, Manual, Otis Quick Scoring Mental Ability Tests, London, George G.Harrop, p.8.

In a study by McIntosh[1] of thirteen thousand boys and girls in Comprehensive schools in London who had been allocated to five ability groups on entry based on the results of an intelligence test and attainment tests, it was found that membership of the top ability group gave an enhanced likelihood of membership of school representative sports teams as compared to the lowest ability groups. Whilst he considered that his investigation had established that boys and girls with high mental ability dominate the school representative teams McIntosh[2] was careful to point out that this did not mean that children of low mental ability cannot succeed in competitive sport, nor was any causal relationship suggested. The causes indeed could well be complex.

With 330 secondary school boys aged 14-15 Boulton[3] investigated the relationship between mental ability, as indicated by streaming; games ability as indicated by team selection; and physique, measured by a width/height index. He concluded that the more gifted a boy is academically and in physique, the more likely he is to do well in school sports.

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[1] P.C.McIntosh, "Physical Education and Success in Sport", The International Olympic Academy 5, Athens, Helenic Olympic Committee, 1965, pp.160-170.

[2] Ibid, p.170.

[3] S.M.Boulton, "Relationships Between Mental Ability, Physique and Various Competitive Games Activities of Adolescent Boys", Research Papers in P.E., 3, 1966, pp.3-13.

Start[1] also studied the relationship of intelligence to games performance. With 180 Grammar school boys aged 12-15 he found no significant relationship between games performance and streaming A - E based on annual academic exams. This group, of course, was very different to that of the McIntosh study since it was a selected group in terms of intelligence and would correspond with the upper ability group of the McIntosh enquiry.

A positive relationship between intellectual status and social emotional status (r = .355 significant at .01) was found by Brown and Trachtman[2] who studied fifty-seven 12 year old boys. They used the California Test of Mental Maturity and the Metropolitan Achievement Test, the California Test of Personality, the Haggerty-Olson-Wickman Scale and Teacher Ratings as their measuring instruments.

Regarding inter-relationship of intelligence to personality Eysenck and White[3] stated that it is usually maintained that intelligence is statistically independent of personality factors such as neuroticism and extraversion. They suggested, however, that it would be unwise to equate statistical independence with lack of interaction and

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[1]K.B.Start, "The Relationship Between the Games Performance of a Grammar School Boy and his Intelligence and Streaming", Scottish Bulletin of Physical Education, 1:3 (July 1964) pp.83-87.

[2]Roscoe Brown Jr. and Alvin Trachtman, "A Study of Inter-relationships between Physical, Intellectual, Social and Emotional Development of Elementary School Boys and Girls", Mimeographed report, New York, p.6.

[3]H.J.Eysenck and P.O.White, "Personality and the Measurement of Intelligence", British Journal Educational Psychology, 34.2 (June 1964), pp.197-202.

pointed out that most studies had used statistical methods based on product moment correlations, thus setting orthogonality equal to linear independence and failing to allow for the possibility of curvilinear regression. They concluded that the theory of linear independence between cognitive and non-cognitive factors may have to be supplemented by one stressing non-linear dependence and interaction.

Intelligence has been shown to be a major factor influencing level of achievement motivation, which Atkinson[1] has described as being a disposition which might be conceived as "a capacity for taking pride in accomplishment". Jayasuriya[2] found that in general the higher the intelligence of an adolescent boy the higher the level of achievement motivation and when intelligence was held constant social class differences in level of achievement motivation became insignificant. His findings were duplicated with boys and girls aged 9-11, by Bruckman[3] who found a signfficant (.01) relationship between intelligence and level of achievement motivation.

With the evidence of relationships of mental ability and sporting prowess with social emotional status, with level of achievement motivation and the possibility of

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[1] J.W.Atkinson, An Introduction to Motivation, Princeton, Van Nostrand, 1964, p.241.

[2] D.L.Jayasuriya, "Study of Adolescent Ambition Level of Aspiration and Achievement Motivation", Ph.D. Thesis, University of London, 1960, p.268.

[3] Idel R.Bruckman, "The Relationship Between Achievement Motivation and Sex, Age, Social Class, School Stream and Intelligence", British Jourhal Social Clinical Psychology, 5, 1966, p.211.

curvilinear relationship between mental ability and aspects of personality it was considered necessary to hold mental ability constant between members of the competitive and control groups.

Social Background

The environmental background of the two groups was held as constant as possible.

Competitors from Northumberland and Durham were matched with boys living in the same area. Similarly those competitors from the West Riding and South Yorkshire area were matched with boys from that area.

The type of education the boys were pursuing was held constant. Those undertaking courses leading to more academic type examinations were matched with boys pursuing a similar academically biased programme. Those boys pursuing a less rigorous academic education were matched with boys from a similar type of school.

Boys in each group were matched in terms of broad classifications of parental occupation.

The influence of environment on personality traits was discussed by Warburton and Kane[1]. They stated that the relative contribution of genetic, environmental and interaction factors on human trait values is normally argued on the basis of Mendelian evaluation of the gene contribution to a particular trait, or by the statistical

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[1]Frank W.Warburton and John E.Kane, "Personality Related to Sport and Physical Ability", Readings in Physical Education, Ed. J.E.Kane, London, P.E.A., 1966, p.62.

device of variance analysis. On the basis of the latter technique it is commonly taken that about 20% of the variability in intelligence is due to environment. Similarly it can be said that approximately two-thirds of the variance in extraversion and neuroticism is due to environmental influence. In contrast in Parmia the hereditary determination is almost as high for intelligence.

With regard to type of education, studies have illustrated differences in traits displayed by boys attending the more academically orientated Grammar Schools and those attending Secondary Modern Schools.

Cellard and Goodfellow[1] who administered the Junior Maudsley Personality Inventory to over three and a half thousand boys in Grammar, Secondary Modern and Comprehensive schools in S.W. England found no significant differences between groups of pupils attending the different types of school on the extraversion scale but the Grammar School boys both in rural and urban areas were significantly lower on neuroticism than were Secondary Modern boys. The score for boys attending Comprehensive schools fell between the other two. They stated that the findings of their enquiry led to the conclusion that neuroticism scores of school-boys reflect failure or success in selection for Grammar schools with a generally lower neuroticism score among Grammar school pupils as a whole.

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[1] M.Pauline Cellard and Christine N.Goodfellow, "Neuroticism and Extraversion in Schoolboys as Measured by the Junior Maudsley Personality Inventory", British Journal of Educational Psychology, 32,3 (November 1962), pp.241-250.

Banik[1] found that boys from Grammar schools showed more frustration and aggression than boys from Secondary Modern schools with the scores of boys from Comprehensive schools coming somewhere between. He suggested that a possible reason may be that Grammar school boys face heavy competition for better results and have fewer outlets for expressing their aggressive feelings than do the Secondary Modern boys where more emphasis is placed on extra-academic activities.

Bene[2] found that Grammar school boys had less positive feelings than did Secondary Modern boys. She too stated that the former were under greater pressures, felt more frustrated and consequently displayed fewer positive attitudes.

Musgrove[3] working with boys from Grammar, Secondary Modern and Technical schools stated that it is experience of a particular type of institution rather than pre existing personality traits or social background which promotes or reduces conflicts in adolescent boys. He concluded that Grammar schools which make:

> "extreme demands upon their pupils and emphasise their dependence and protracted exclusion from full involvement in adult affairs may induce

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[1] Banik, Op.cit., p.160.

[2] E.Bene, "The Objective Use of a Projective Technique, Illustrated by a Study of the Differences in Attitudes Between Pupils of Grammar Schools and Secondary Modern Schools", British Journal of Educational Psychology, 27,2 (January 1957), pp.89-100.

[3] F.Musgrove, "Role Conflict in Adolescence", British Journal of Educational Psychology, 34:1 (February 1964), pp.34-42.

> a deeper sense of conflict than the Modern School with its more moderate demands and immediate relationships, particularly for the 14 and 15 year olds, with the adult world."

In view of the findings of these studies it was decided to hold constant the type of educational course followed by ensuring that each competitor and his matched control attended a comparable type of school.

One reason for equating groups in terms of socio-economic classification was to avoid the possibility of having one group composed of boys who were maturing earlier than the other group since Tanner[1] has shown that the higher the social class, the earlier do children mature.

The significance of equating individuals in terms of parental occupation was emphasised by Sims[2] when he pointed out that apart from determining the economic resources of a family this factor "....determines the associations of members of the family, the leisure time they enjoy and to a large degree their cultural interests".

Karl and Davis[3] factor analysed nineteen indices of social and economic circumstances of 219 men. Based on the results of their analysis they stated that the best single index of socio-economic status was an occupational scale.

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[1] J.M.Tanner, Growth at Adolescence, 2nd Ed., Oxford, Blackwell Scientific Publications, 1962, p.139.

[2] Verner M.Sims, Measurement of Socio-Economic Status, Bloomington, Illinois Public School Publishing Co., 1954, p.28.

[3] Joseph A.Karl and James A.Davis, "A comparison of Indices of Socio Economic Status", American Sociological Review, 20 (June 1955), pp.317-325.

The cross cultural stability of such a classification was illustrated by Inkeles and Rossie[1] who found a high level of agreement when they examined occupational ratings in six modern industrialised countries. They reported a product moment correlation of .94 between prestige scores given to comparable occupations in the United States and the United Kingdom.

Recently Eysenck and Cookson[2] reported a study, one of the findings of which was that parental occupational status was associated with extraversion, stability, intelligence and scholastic achievement in children with those children from higher status families scoring higher. In the same study they reported that smaller families were associated with brighter, more extravert and less neurotic children but that position in a family was not relevant to personality nor ability[3]. In this present study family size was not a variable on which the groups were matched but as stated (p. 124) intelligence was equated.

Physical Status

Each member of the competitive group was matched with his control in terms of having comparable potential to succeed in sporting pursuits. Since a relationship between

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[1] A.Inkeles and P.H.Rossie, "National Comparisons of Occupational Prestige", American Journal of Sociology, 61, 1956, pp.329-335.

[2] H.J.Eysenck and D.Cookson, "Personality in Primary School Children", British Journal Educational Psychology, 40,2 (June 1970), pp.119-120.

[3] Ibid., p.131.

sports prowess, peer rating and social adjustment would appear to have been established in numerous research studies, it was considered desirable to match the groups in sports potential. They were matched in terms of strength, measured instrumentally.

Bower[1] found that physical ability was important for popularity. In his study the two variables correlated .39. He stated:

> "The effect of physical ability on popularity seems to be direct, through in turn partially dependent on strength as well as symetry and form of structure."

He considered that strength was important since it underlay favourable traits such as physical ability and functional traits - activity, aggressiveness and leadership. He found a significant correlation between strength and popularity.

Jones[2] had found a positive relationship between the strength of boys and their popularity and regarded this as evidence of the role of physical prowess in the adolescent value system. He suggested that absence of this characteristic was a handicap to an adolescent boy which could only be overcome by strongly compensating personal traits in other highly valued areas.

Clarke and Petersen[3] studied 88 boys aged 10-12 and

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[1]Philip A.Bower, "The Relation of Physical, Mental and Personality Factors to Popularity in Adolescent Boys", Microcarded Ph.D. Dissertation, University of California, 1941, p.138.

[2]H.E.Jones, Motor Performance and Growth: A Developmental Study of Static Dynanometric Strength, Berkley, University of California Press, 1947, p.181.

[3]H.Harrison Clarke and Kay H.Petersen, "Contrast of Maturational Structural and Strength Characteristics of Athletes 10-15 years of Age," Research Quarterly 32:2 (May 1961), p.174.

114 boys aged 13-15 and found that strength was a consistent differentiator of athletic (sports) ability. They found that this was particularly true of gross strength measures. At both school ages gross strength means of the high ability sports groups were significantly higher than the means of lower ability groups.

Cureton[1] stated that several research workers had presented evidence that strength is a fundamental element in athletic success in the more vigorous type of activities. He reported that in predicting a four item athletic index, Strength Index gave a multiple correlation of .83 with data on Secondary school boys.

McCloy and Young[2] stated that strength is one of the most important elements in motor performance. Rogers[3] in his early work on Strength Index reported correlations of .64 and .66 between a four item athletic index and leg and back strength respectively. He considered that leg strength was vital to success in any form of athletics.

Bookwalter[4] found that the results of nine factor

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[1]T.K.Cureton, Physical Fitness Appraisal and Guidance, St.Louis, C.V.Mosby, 1947, p.366.

[2]Charles Harold McCloy and Norma D.Young, Tests and Measurements in Health and Physical Education, 3rd Ed., New York, Appleton Century Crofts Inc., 1954, p.148.

[3]Frederick Rand Rogers, Fundamental Administrative Measures in Physical Education, Newton, Mass., Pleides Co., 1932, p.137.

[4]K.W.Bookwalter, "A Critical Evaluation of the Application of some of the Existing Means of Classifying Boys for Physical Education Activities", Microcarded Ph.D. Dissertation, New York University, 1938, p.247.

analysis studies consistently pointed to the isolation of strength as a major factor associated with successful performance in physical education activities.

In addition to the purpose of having groups of comparable potential in sports ability, equating in terms of strength meant that there was a possibility that the competitor and his control might be matched in physiological maturity. Jones[1] had demonstrated that grip strength scores of early maturing boys were greater than the mean for the average maturing boys, and that late maturing boys were lower in mean strength than the average maturing boys. With 46 twelve-year old boys divided into Advanced, Normal and Retarded Maturity groups on the evidence of skeletal X-Rays, Clarke and Harrison[2] found significant differences between the advanced and retarded maturity groups on Grip Strength (.01), and on leg strength (.02), and between all three groups at .01 level on a gross strength measure - the mean of eleven cable tension strength tests.

Whilst skeletal X-Rays would have been necessary in this study to establish matching of physiological maturity it is contended that matching in terms of strength is an indication of possible equality of maturity in broad terms.

Consideration was given to matching in terms of body build in view of the association of certain physical and

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[1] Jones, loc.cit.

[2] H.Harrison Clarke and James C.E.Harrison, "Differences in Physical and Motor Traits of Boys of Advanced, Normal and Retarted Maturity", Research Quarterly, 33:1 (March 1962), pp.13-25.

temperamental characteristics suggested by a number of writers in particular, in more recent times, by Sheldon and Stevens[1]. They classified a group of 200 young men on body types and on a rating of temperament and obtained high correlation between endomorphy and visceratomia, mesomorphy and somatotomia, and ectomorphy and cerebratomia. About the same time Sandford et al[2] published the findings of their study where 43 children, about half of them boys, were tested at intervals over a three year period. Personality was assessed by ratings, inventories and projective tests, and physique by eighteen anthropometric measures. They found that tall narrow physique correlated positively with personality syndromes characterised by self sufficiency, guilt feelings and remorse, whilst wide heavy physique correlated positively with good fellowship, social feeling and lively self expression. However, they were careful to point out that correlations were not high and that their method of selection of subjects was such that it could not be regarded as a fair sample of all school children and no attempt was made to generalise from their group to the population at large.[3]

Eysenck[4] reviewing work on personality correlates of

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[1] W.H.Sheldon and S.S.Stevens, The Varieties of Temperament, London, Harper Bros., 1942, p.419.

[2] R.N.Sanford et al., "Physique, Personality and Scholarship", Washington, Monograph, Social Research in Child Development, 1943, p.528.

[3] Ibid., p.7.

[4] H.J.Eysenck, Dimensions of Personality, London, Kegan Paul, 1947, pp.83-94.

physique stated that the concept of a relationship between the two had been held since the time of Ancient Greece. He pointed out that contradictory results had been obtained in experiments and that in his own researches, whilst certain relationships had been found, the correlations were low and from the practical point of view the findings were not of great importance. More recently, Kane[1] studied the relationship of personality measured by 16PF and physique measured by the phenotype method of Parnell[2], with college age subjects. Kane analysed his results by discriminant function and canonical correlation and found no positive relationship between phenotype and personality. This finding was not in accord with the general theories of Sheldon[3] but Kane pointed out that there have not been any major researches which have fully corroborated Sheldon's original findings.

In view of Eysenck's[4] conclusions it was decided not to include measures of physique as one of the matching variables. However, when pairs were being matched on the other variables care was taken to ensure that there was not too large a discrepancy in height and weight of the matched pairs so that there was no possibility of one group being composed of, for instance, tall heavy boys, whilst

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[1] J.E.Kane, "Personality in Relation to Physical Abilities and Physique", Ph.D. Thesis, University of London, 1968, p.324.

[2] R.W.Parnell, Behaviour and Physique, London, Edward Arnold, 1968, pp.13-25.

[3] Sheldon and Stevens, loc.cit.

[4] Eysenck, loc.cit.

the other included short thin boys. The matching in terms of strength was to some extent a cross check on this since, generally speaking, the stronger the boy the more likely he is to be a heavier boy.

Test selected for matching purposes

The following tests were selected for matching purposes. In addition to selecting valid and reliable tests a further consideration was that of having a battery of tests which could be administered within the time limitation which schools and clubs were prepared to allow their boys for the purposes of the study. This varied somewhat, but in schools was from a one to two double periods, i.e. one or two sessions of $1\frac{1}{2}$ hours, for matching purposes, according to the number of subjects being tested.

1. Chronological Age: Date of Birth - a difference of not more than four months.

2. Mental Age: Otis Quick Scoring Mental Ability Beta Test (Form A) - a difference of not more than four months in mental age.

   The Beta test is for ages 10-15, comprises eighty items and requires thirty-five minutes to administer. It is termed 'Quick Scoring' because of the ease of scoring with the aid of a key. Otis[1] stated that the purpose of the test was to measure mental ability - thinking power or the degree of maturity of the mind.

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[1] Otis, Op.cit., pp.1-12.

He pointed out that it is not possible to measure mental ability directly but only the effect that mental ability has had in enabling a pupil to acquire certain knowledge and mental skill. He listed as one of the uses of the test that of research purposes for obtaining two groups of equal mental ability. Age norms for this test were available. Reported reliability co-efficients include correlations of .826 and .859 between forms A and B and B and A at the age range at which the test was given in this present study, and at this same age a split halves reliability co-efficient of .90.

3. Social Background:

(i) Geographical location of home:

(a) Northumberland and Durham.

(b) West Riding and South Yorkshire.

(ii) Type of education:

(a) More academically biased 'Grammar' type.

(b) Less academically biased.

(iii) Registrar General's Social Classes[1]:

(a) Higher Administrative, Professional and Managerial Workers, including Employers.

(b) Intermediate Administrative, Professional and Managerial Workers, including farmers, teachers, shop keepers and small employers.

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[1]General Register Office, Classification of Occupations, London, H.M.S.O., 1966, pp.x-xi.

(c) Shop Assistants, clerical workers, formen and supervisors, personal services and skilled workers.

(d) Semi-skilled workers, agricultural labourers.

(e) Unskilled workers.

4. Strength: Total Proportional Strength. A four-item battery. Right and left grip strength measured by manuometer and back and leg strength measured by dynamometer. The sum of the four items measured in pounds gives what is called Total Proportional Strength. For matching purposes a difference of not more than 10% was considered acceptable.

Cureton[1] has pointed out that the total strength of all the muscle groups of the body is never measured but the four measurements may be considered proportional to total strength and correlations are undoubtedly high. He reported correlations of .777 between Total Proportional Strength and Strength/Weight Ratio and .414 between Total Proportional Strength and Illinois Motor Fitness Test. Test-retest at an interval of seven days conducted by the present researcher on a group of 24 twelve year old boys resulted in correlations as follows:

Right Grip	r = .87
Left Grip	r = .88
Back Strength	r = .45
Leg Strength	r = .93
Total Proportional Strength	r = .96

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[1]Cureton, Op.cit., p.368.

It was considered that reliability of test procedure had been established.

Matching Test Scores

Table 9.1 in the Appendix gives details of scores on the matching tests. The pairs were matched as described except that five pairs had a five months chronological age gap, six pairs had more than four months difference in mental age and for seven pairs there was a one grade difference on socio-economic background. Of the eight differences in locality five were deliberate matchings of boys from Hull (Y) with boys from the South Shields and Teesside (D) area because it was considered to be a closer match of locality.

These differences were occasioned by Control group boys dropping out of the study and having to be replaced with boys on the reserve control list. Despite the variations listed above it was considered that the Competitive and Control groups had been closely matched.

The Assessment of Personality

Although few of the researchers responsible for the studies considered in Chapter 2 have stated the theoretical base from which they have approached their investigations of personality differences, it is fairly obvious, either from their experimental method or from their interpretation of findings, that different researchers have undertaken their studies from different standpoints of personality theory.

Hall and Lindzey[1] considered twelve different theories of personality and having analysed them suggested that the time was not opportune to attempt a synthesis of theories whose empirical utility remained largely undemonstrated.[2] Eysenck[3] discussing the multiplicity of personality theories stated that it was no use arguing that there are so many theories that one cannot make a choice for research but that it is only by making such choices and embodying them in experiments that the educational psychologist will improve the situation and make future choices easier and more fruitful.

As might be expected there are many different definitions of personality. Indeed Allport[4] reviewed and analysed forty-nine different definitions of personality before pronouncing his own. However, Eysenck[5] reduced all definitions to two broad groups, those which are in terms of outer observable appearances and those which are in terms of inner functional influences. Masoner[6] referred to the two basically opposed meanings as being 'mask' and

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[1] C.W.Hall and G.Lindzey, Theories of Personality, New York, Wiley, 1957, pp.64-536.

[2] Ibid, p.557.

[3] H.J.Eysenck, The Biological Basis of Personality, Springfield, Charles C.Thomas, 1967, p.5.

[4] G.W.Allport, Personality: A Psychological Interpretation, London, Constable, 1937, pp.27-47.

[5] H.J.Eysenck, Dimensions of Personality, London, Kegan Paul, 1947, p.24.

[6] Paul H.Masoner, "A Critique of Personality Rating Scales", Microcarded Ph.D. Dissertation, University of Pittsburgh, 1949, p.19.

'substance' definitions. The former is concerned with the outer superficial aspects of behaviour and the latter places emphasis on the inner nature, or substance, of man. He stated that psychologists who have accepted the latter type of definition have been willing to think in terms of inner psychological states, processes, structures and relationships, in an attempt to make more meaningful and understandable the observed pattern of mass behaviour.

Eysenck[1] accepts the definition of personality given by Warren[2]:-

> "the integrated organisation of all the cognitive, affective, conative and physical characteristics as it manifests itself in focal distinctness to others."

Eysenck[3] states that this includes both mask and substance views and perhaps comes nearest to the general consensus of psychological thought.

Discussing the measurement of personality Masoner[4] suggested that unless one subscribed to the definitions and beliefs of the extreme specifist, such measurement could be accepted as an activity profitable in understanding individuals. The definition may be biophysical, integrative, a field approach type or any other which admits the existence of traits, in which case measurement can be concerned with the elements of which personality

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[1] Eysenck, Op.cit., p.27.

[2] H.C.Warren, ed. Dictionary of Psychology, Boston, Houghton Mifflin, 1934, p.197.

[3] Eysenck, loc.cit.

[4] Masoner, Op.cit., p.32.

is constituted.

Shafer et al[1] describe traits as consistent indicators of personality. They agree that all persons will vary somewhat in their behaviour, being possibly aggressive in some situations and submissive in others, nevertheless, they would exhibit consistent or habitual indications of a particular trait. Mackinnon[2] referred to traits as "broad, generalized, complex, overlapping but relatively stable and enduring disposition to action as the most important and genuine components of personality". Allport[3] had earlier defined a trait as:

> ".....a general neuropsychic system (peculiar to the individual) with the capacity to render many stimuli functionally equivalent and to initiate and guide consistent (equivalent) forms of adaptive and expressive behaviour."

Giving consideration to the consistency of traits Allport[4] stated that consistency was not a matter of stereotyped habits but rather of equivalent responses. Perfect consistency was not to be expected as a criterion of the existence of traits and slight inconsistencies in behaviour was not an indication that traits as enduring dispositions do not exist.

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[1] Lawrence Shafer et al., Psychology, New York, Harper, 1940, p.420.

[2] Donald W.Mackinnon, "The Structure of Personality", in Personality and the Behavioural Disorders", ed. J.V.Hunt, New York, The Ronald Press Co., 1944, p.40.

[3] Gordon W.Allport, Personality, A Psychological Interpretation, New York, Henry Holt and Co., 1937, p.295.

[4] Ibid., pp.330-331.

Cattell[1] stressed the importance of traits:

> "The attributes by which it (personality) is described and measured are traits (structures or dispositions defining potential behaviour) which may be considered properties of the organism but which can be defined only in terms of the organism and its environment, i.e. as relationships between the physiological organism and its environment."

Cattell[2] stressed that a trait does have consistency. He does not reject the idea that the situation is important in the understanding of personality, but believes that the personality of an individual is one of the most convenient points of reference for the approximate prediction of events.

Warburton[3] pointing out that the observation of a person is an analytical process as is the act of observing anything, concluded:

> "Certainly for purposes of personality measurement the term 'personality' is usually taken to refer to the sum total of a number of discrete social and emotional qualities such as stability, liveliness, perseverence, carefulness and sociability, i.e. to traits based on the way in which an individual behaves in his environment."

This concept of personality is the one which is followed in this present study and forms the theoretical base from which the selection of measuring instruments was made.

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[1] Raymond B. Cattell, Description and Measurement of Personality, New York, World Book Co., 1946, pp.544-567.

[2] Loc.cit.

[3] F.W. Warburton, "The Measurement of Personality", Educational Research, 4:1 (November 1961), pp.2-17.

Selection of Method of Measurement

Each method of personality assessment currently in use was considered and the personality inventory was selected as being the most suitable for this study, both in terms of traits measured and in practical consideration of test administration within the time permitted by schools and clubs for the collection of data.

The use of a rating method of assessing personality was clearly not a practical possibility within the design of the study partly due to the fact that the subjects were scattered throughout three counties in the N.E. Furthermore, Masoner[1] when reviewing rating scales of personality of High School children in one hundred schools in twenty-nine states in the U.S. had suggested that each child should be assessed by at least five raters. Warburton[2] had recommended from four to twenty raters and Eysenck[3] had cast doubt on the concept of rating when he pointed out a fundamental difficulty in the method:

> "What the rater says about the ratee may be taken as evidence of some quality inherent in the ratee but it may also be taken as evidence of some quality inherent in the rater."

The use of objective personality tests such as the Rotating Spiral After Effect test (a measure of extraversion) was rejected because of the time factor required in their administration and the use of projective tests, e.g. Rorscharch,

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[1] Masoner, Op.cit., p.198.

[2] Warburton, Loc.cit.,

[3] H.J.Eysenck, Sense and Nonsense in Psychology, Harmondsworth, Penguin Books, 1966, p.186.

was also rejected due to difficulty of interpretation.

There is no doubt that there have been, and indeed there still are, critics of the questionnaire type of test. However, much of the criticism relating to early attempts at this type of test has been countered by more refined test construction of recent years. Vernon[1] is one who has criticised such tests. He stated that however detailed the profile it does not amount to a person, but concedes that the scores "provide some useful guidance on broad qualities". He pointed out the susceptibility of such tests to faking and response sets. However, inclusion of a lie scale in a battery of tests and elimination of those subjects scoring high meets the criticism of faking which Warburton[2] has suggested is in any case ".....the exception and not the rule". With regard to response sets present day constructors make provision to guard against the possibility in the construction of the tests. Eysenck, Syed and Eysenck[3] conducted an experiment into the desirability response set in children using the Junior Eysenck Personality Inventory for the measurement of extraversion, neuroticism and lying. Their results were interpeted as indicating that under normal testing procedures social desirability

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[1]Philip E.Vernon, "The Personality System" in Studies in Psychology, ed. Charlotte Bank and P.L.Broadhurst, London, University of London Press, 1965, p.56.

[2]F.W.Warburton, "The Measurement of Personality II", Educational Research, 4:2 (February 1962), p.122.

[3]Sybil B.G.Eysenck, I.A.Syed and H.J.Eysenck, "Desirability Response Set in Children", British Journal Educational Psychology, 36.1 (February 1966), pp.87-90.

response set was "unlikely to have accounted for more than a small portion of the variance". This supported the conclusion of Rorer[1], who, following an extensive review of studies relating to response styles concluded that:

> "The inference that response styles are an important variable in personality inventories is not warranted on the basis of the evidence now available."

Warburton[2] pointed out that personality questionnaires were fairly widely used in the United States but were less commonly applied in Britain. (During the sixties however they have been more extensively used in this country.) He continued "The best tests are probably those of Eysenck, Cattell and Guilford".

Personality inventories are in frequent use in research studies. In Chapter 2 numerous studies were reported which had used this method. In addition there are many reports in the literature where this method has been employed in educational research, particularly in investigations of the relationships between personality factors and scholastic attainment.

Support for the validity of personality questionnaires has been given by Eysenck and Eysenck[3]. They stated that the vast majority of studies in the personality field use either ratings or questionnaires. They had reviewed

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[1] Leonard G.Rorer, "The Great Response Style Myth", Psychological Bulletin, 63,3 (March 1965), p.150.

[2] Warburton, Op.cit., p.119.

[3] Sybil B.C.Eysenck and H.J.Eysenck, "The Validity of Questionnaire and Rating Assessments of Extraversion and Neuroticism and their Factorial Stability", British Journal of Psychology, 54:1 (February 1963), pp.51-62.

the available evidence and concluded that whilst both methods were subject to possible errors of various kinds these errors were different for the two methods, thus agreement between them could reasonably be regarded as evidence of validity for both. Disagreement could not be interpreted so easily since it could be due to lack of validity in either or both. Accordingly, they applied a 188 item questionnaire which included the Maudsley Personality Inventory to nominated groups of twenty-five subjects each portraying Extraverted, Introverted, Neurotic and Stable characteristics, the groups being selected by a panel of psychologists according to definitions supplied. The results of factor analysis showed considerable agreement between ratings and questionnaire with significant (.01) correlations of .883 on extraversion and .676 on neuroticism.

Warburton[1] gave support to the use of personality questionnaires in research and stated:

> ".....there is a great deal of evidence that personality questionnaires make a valuable contribution to our assessment of psychological qualities".

On another occasion Warburton[2] considered the criticism that personality assessments are too static. He recognised that any single piece of behaviour depends on a multiplicity of factors in the personality and in the environment and continued:

> ".....there is a great deal of life in the categories proposed by Cattell, by Eysenck and

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[1] Warburton, loc.cit.

[2] Warburton, "The Measurement of Personality III", Educational Research, 4:3 (June 1962), p.193.

> by Guilford; and an account of an individuals personality solely in terms of Cattell's fifteen traits given by a person fully acquainted with their use by no means presents an unmoving picture of the situation."

There would appear to be ample evidence of both the value and the extensive use of, the personality inventory. Further supporting evidence is given in the sections relating to the particular tests selected for this study.

Selection of Personality Inventories

Two personality inventories were selected to use in the study. These were Cattell's High School Personality Questionnaire (H.S.P.Q.) and Eysenck's Junior Personality Inventory (J.E.P.I.). Both these tests are the result of a considerable and lengthy period of research and are based on factor analytic procedures. The H.S.P.Q. is intended for use with children aged 12-17 years. Thirteen of the traits recur in the Cattell 16PF which is a comparable test for adult age, thus direct comparisons can be made, and extended logitudinal measurement is possible, indeed this was a further reason for the selection of this test.

Tests are also available for administration to children younger than twelve, the Children's Personality Questionnaire (C.P.Q.) and the Early School Personality Questionnaire (E.S.P.Q.). H.S.P.Q. overlaps the upper age for which C.P.Q. is intended (8-12 years) by one year. The test measures fourteen primary source traits and four secondary factors; extraversion, anxiety, cortertia and independence.

The J.E.P.I. is a development of the Maudsley Personality Inventory and the Eysenck Personality Inventory, both of

which have been extensively used in reported research. This test measures two higher order factors, extraversion and neuroticism, and includes a lie scale for the detection of faking. One reason for its inclusion in the study was for purposes of cross reference on a common measure with the Cattell test - extraversion. In addition there was a lie scale which was used for eliminations of possible unreliable responses, and norms for British boys on the traits measured were available.

Warburton and Kane[1] considered that Cattell and Eysenck have, by general acclaim, contributed more than anyone else to objective measurement of personality and that "their questionnaire techniques appear to be scientifically more viable than any other at present."

Cattell[2] discussed the development of personality testing and referred to methods employed by psychologists such as Eysenck and himself.

> "Personality and ability measurement has made a major shift from a mere setting of homogeneous scales for arbitrarily defined popular notions to the designing of factor scales for proven functional unities.
> .....the new movement in psychological testing first spends much time in basic research on personality structure as such, and proceeds to develop a test only when a clear cut functionally and unitary response pattern has been located, to which a measurement can be applied with known conceptual validity."

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[1] Frank W.Warburton and John E.Kane, "Personality Related to Sport and Physical Ability", Readings in Physical Education, ed. John E.Kane, London, P.E.A., 1966, p.74.

[2] Raymond B.Cattell, "Some Psychological Correlates of Physical Fitness and Physique" in Exercise and Fitness, Chicago, The Athletic Institute, 1960, pp.141-142.

Cattell[1] states that the 16PF and H.S.P.Q. are of this nature.

Kane[2] also commented on availability of psychological measuring instruments which are of sounder scientific construction than was formerly the case. He considered that this was particularly so in the assessment of personality where factor scales of proven functional unity have replaced arbitrarily defined scales. He emphasised the value of scales, such as Cattell's, based on factor analytic approach, for making a sounder and easier interpretation by different investigators.

Cross cultural comparisons are possible using a test such as Cattell's. Translated versions of the 16PF and/or H.S.P.Q. are available and in use in fifteen different countries, according to Cattell and Beloff[3]. Such a comparison was carried out by Cattell and Warburton[4] who compared 204 University graduates and College of Advanced Technology students in Britain with 604 University students in U.S.A. using 16PF. Amongst their findings on second order factors were that the American students had a

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[1] Loc.cit.

[2] John E.Kane, "Psychological Correlates of Physique and Physical Abilities", in International Research in Sport and Physical Education, ed. E.Jokl and E.Simon, Springfield, Illinois, Charles C.Thomas, 1964, p.87.

[3] Raymond B.Cattell and Halla Beloff, Handbook for the High School Personality Questionnaire, 2nd Edn, Champaign, Illinois, Institute of Personality and Ability Testing, 1962, p.5.

[4] Raymond B.Cattell and Frank W.Warburton, "A Cross Cultural Pattern of Extraversion and Anxiety", British Journal of Psychology, 52:1, (February 1961) p.14.

significantly (.001) higher level of Anxiety than either British University or C.A.T. groups, and were significantly (.001) more extrovert than the British University group. Warburton[1] regarded this as an example of concurrent validity for the test, i.e. the ability of a test to distinguish between existing groups, e.g. to see whether test scores for different groups correlate with expectations.

Kroll and Petersen[2] similarly found that Cattell's test had concurrent validity when they commented on the results of a study in which 16PF had been used in an attempt to discriminate between consistently winning and consistently losing collegiate football teams. They stated that the percentage of correct classifications strongly suggested the 16PF was a valuable tool for demonstrating personality differences.

Cattell, Sealy and Sweney[3] have suggested that in recent years basic factor analytic research on general personality and motivation structure has reached a degree of stability of replication that has justified the setting up of personality scales in terms of objective tests and questionnaires. They listed published questionnaire versions as H.S.P.Q., C.P.Q., and E.S.P.Q. and stated that

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[1] Warburton, Op.cit., p.196.

[2] Walter Kroll and Kay H.Petersen, "Personality Profiles of Collegiate Football Teams", Research Quarterly, 36:4 (December 1965), p.443.

[3] R.B.Cattell, A.P.Sealy and A.B.Sweney, "What can Personality and Motivation Source Trait Measurement add to the Prediction of School Achievement", British Journal Educational Psychology, 36:3 (November 1966), pp.280-295.

they measure general personality factors which are psychologically and clinically meaningful and which have been found to persist across age levels and across cultures.

Support for the use in educational research of the H.S.P.Q. has also come from Butcher, Ainsworth and Nesbitt[1] who stated that the test ".....appears to be one of the more promising instruments available for use with children...." One of the advantages of the test, they felt, was that the factors measured had emerged from a considerable body of prolonged research.

There would seem to be little doubt that Personality Questionnaires based on factor analytic research such as those of Cattell and Eysenck have largely met criticisms levelled at inventory techniques, and providing certain conditions are met in their administration they would appear to be an acceptable method of assessment of personality for this present study. Indeed when the research was begun (1967) there did not seem to be any more preferred method available, a conclusion which numerous other researchers must have arrived at if one is to judge by the prevalence of use of the tests of these two psychologists in the recorded research reports.

High School Personality Questionnaire

Each of the equivalent forms of the H.S.P.Q. consists of a 140 item questionnaire measuring fourteen primary

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[1] H.J.Butcher, M.Ainsworth and J.E.Nesbitt, "Personality Factors and School Achievement, A Comparison of British and American Children", British Journal Educational Psychology, 33:3 (November 1963), p.276.

source traits and four second order factors. These factors are set out in brief in Table 1.1 below, detailed psychological meaning of each factor is presented in the Appendix (pp.398-409).

TABLE 1.1

Technical Titles and Popular Descriptions of Fourteen Primary and Four Second Order Personality Factors Measured by the H.S.P.Q.

Primary Factor	Technical Title		Popular Description	
	Low Score	High Score	Low Score	High Score
A	Schizothymia	Affectothymia	Aloof, Stiff	Warm, Sociable
B	Low Intelligence	High Intelligence	Dull	Bright
C	Ego Weakness	Ego Strength	Emotional, Unstable	Mature, Calm
D	Phlegmatic Temperament	Excitability	Undemonstrative	Unrestrained
E	Submissiveness	Dominance or Ascendancy	Mild	Aggressive, Competitive
F	Desurgency	Surgency	Sober, Serious	Enthusiastic, Happy-go-lucky
G	Low Super Ego Strength	High Super Ego Strength	Expedient	Conscientious, Persistent
H	Threctia	Parmia	Shy, Timid, Threat-sensitive	Adventurous, Socially bold
I	Harria	Presmia	Tough, Realistic	Sensitive, Dependent
J	Zeppia	Coasthenia	Liking group action	Circumspect, Individualism
O	Untroubled Adequacy	Guilt Proneness	Self-assured	Apprehensive, Insecure
Q2	Group Dependency	Self Sufficiency	Sociably Group Dependent	Self-sufficient, Resourceful
Q3	Low Self Sentiment Formation	High Strength of Self Sentiment	Uncontrolled, Lax	Controlled, Exacting Will Power
Q4	Low Ergic Tension	High Ergic Tension	Relaxed, Composed	Tense, Frustrated
Second Order Factor				
Q_I	Invia	Exvia	Socially Withdrawn	Socially Outgoing
Q_{II}	Adjustment	Anxiety	Well adjusted	Anxious
Q_{III}	Pathemia	Cortertia	Low Mental Arousal	High Mental Arousal
Q_{IV}	Subduedness	Independence	Dependent	Independent

Some of the special features of the H.S.P.Q. listed by Cattell and Cattell[1] are that it is equally applicable in group and in individual testing situations; to more or less extended testing according to the amount of time available and the number of the four equivalent forms used. Furthermore the test includes all research demonstrated dimensions of personality of potential importance in clinical, educational and counselling practice and provides a base for routine cumulative records on a child's personality development, on an annual or semi annual basis, using the same kind of scales as are employed at other ages. The H.S.P.Q. is an American test but it has been widely used with British subjects and Cattell, Wagner and Cattell[2] state that a very substantial degree of cross cultural constancy has been found with the same tests in American and British samples.

Earlier when discussing the construction of the test Cattell and Beloff[3] had stated that wherever feasible items were devised which load a factor but which from their content, would not appear to a child, by "face validity" to do so, thus making faking relatively difficult. Again in construction care was taken to assign to each factor scale

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[1]Raymond B.Cattell and Mary D.L.Cattell, Handbook for the Junior-Senior High School Personality Questionnaire, Champaign, Institute for Personality and Ability Testing, 1969, p.5.

[2]Raymond B.Cattell, Anka Wagner and Mary D.C.Cattell, "Adolescent Personality Structure in Q Data Checked in the High School Personality Questionnaire", British Journal of Psychology, 61.1 (February 1970), p.40.

[3]Cattell and Beloff, Op.cit., pp.4-6.

as many items in which 'yes' contributes positively to the total score as items for which 'no' contributes. Thus mental set towards certain responses will not distort the score. In addition the highest possible scale reliability compatible with total length of a single form of the test, such that it can be administered within a single class period, was one of the aims in the test construction.

Cattell and Beloff[1] further stated that with regard to faking:

> ".....methods of research have been used in selecting items for this test which will make faking difficult, the present scale avoids this complication. Indeed, in practice, no evidence has yet been found of any systematic changes in factor scores between situations of anonymity and those where the youth might seem to gain by presenting a more favourable description of his behaviour."

Test - retest reliability coefficients as reported by Cattell and Cattell for one form retested after one day are presented in Table 1.2.[2]

TABLE 1.2

Dependability Coefficients of Single Form H.S.P.Q.

A	B	C	D	E	F	G	H	I	J	O	Q2	Q3	Q4
.85	.78	.77	.80	.74	.76	.72	.81	.88	.81	.83	.82	.78	.84

Cattell and Cattell[3] report homogenity coefficients, the average extent to which items correlate with each other,

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[1] Cattell and Beloff, loc.cit.

[2] Cattell and Cattell, Op.cit., p.9.

[3] Ibid, p.10.

and point out that high homogenity is by no means universally desirable and that in measuring personality factors it is desirable to have items correlating as little as possible with each other whilst consistently correlating to a maximum degree with the underlying factor. The homogenity coefficients are reported in Table 1.3.

TABLE 1.3

Homogenity Coefficients for Single Form H.S.P.Q.

A	B	C	D	E	F	G	H	I	J	O	Q2	Q3	Q4
.22	.40	.25	.26	.34	.30	.41	.36	.43	.20	.40	.26	.36	.40

With regard to validity Cattell and Cattell[1] have stated that what matters crucially is good intensive measurement of the personality factors in the first place and therefore H.S.P.Q. scales are meant to stand or fall by their construct validity, their correlations with the pure factors they are supposed to measure. They reported correlations of direct validity - the multiple correlations between the items in the factor scale with the pure factor. These are reproduced in Table 1.4.

TABLE 1.4

Construct Validity of Single Form H.S.P.Q. as Direct Validities on the Bais of Multiple Correlations Between Items and Pure Factor

A	B	C	D	E	F	G	H	I	J	O	Q2	Q3	Q4
.67	.69	.71	.63	.65	.68	.68	.72	.70	.58	.77	.61	.57	.74

[1]Cattell and Cattell, Op.cit., p.11.

Cattell and Beloff[1] considered that the validities are thoroughly satisfactory for scales of this length. They suggested that there should be no difficulty in obtaining the reliabilities and validities which had been reported provided favourable rapport was established with the children to whom the test was being administered.

For this study it was decided to use one form of the test, Form A, for two reasons. In the first place when negotiations were taking place with regard to obtaining subjects it became obvious that whilst schools and clubs were willing to take part in the research, the amount of time which they could allow to be devoted to test purposes was, understandably, limited and in terms of feasibility it would not have been possible to administer more than one form of the test. Secondly, the experience of the researcher led him to believe that for complete co-operation by children of the age range being studied a test period should not be unduly lengthy. King[2] when considering principles relating to the testing of emotional maturity of children had suggested that the instrument used should be capable of relatively brief administration. He stated:

> ".....from the point of view of realistic considerations of a test programme acceptable to the school, the instrument should be one that will fit readily into established schedules; from the point of view of sampling the child's behaviour the instrument should not take the form of an endurance test."

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[1] Cattell and Beloff, Op.cit., p.8.

[2] Francil Walter King, "Emotional Maturity, its Nature and Measurement", Microcarded Ph.D. Dissertation, Harvard University, 1951, p.219.

With a random group of 20 boys in the present study test--retest dependability coefficients were obtained on H.S.P.Q. factors with an interval of three weeks between tests. These are reported in Table 1.5.

TABLE 1.5

Dependability Coefficients of Single Form H.S.P.Q. Sample Group from Present Study

A	B	C	D	E	F	G	H	I	J	O	Q2	Q3	Q4
.75	.60	.81	.64	.61	.66	.69	.85	.75	.72	.27	.51	.65	.54

Except for factor O these coefficients compare favourably with those reported by Cattell and Cattell[1]. Since the magnitude of the correlations indicates that over a short period of time very comparable replies were made it was considered that changes, if any, in response over a longer period of time of the experiment, could reasonably be regarded as actual changes in personality aspects due to maturation or interaction of the subjects and environmental influences.

A test-retest comparison on total personality profile was made by computing a similarity coefficient which Cattell[2] has compared to a product moment correlation, with regard to interpretation. Procedures followed Cattell and Cattell[3] and a rp of .904 was obtained. This was tested for significance

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[1] See page 158.

[2] R.B.Cattell, "rp and Other Coefficients of Pattern Similarity," Psychometrika, 14:4 (December 1949), p.293.

[3] Cattell and Cattell, Op.cit., p.72.

by reference to a table reproduced by Horn[1] and was shown to be very significant, beyond the .01 level (.424 required with 18 df.). With such a significant correlation between the sample profiles it could be expected that a high correlation would also be found for the total group in the study.

Junior Eysenck Personality Inventory

The J.E.P.I. is a questionnaire of sixty items, twenty-four relate to the measurement of extraversion, twenty-four to neuroticism and twelve questions comprise the lie scale. The scale is intended for administration to children aged 7-16 years. Sybil Eysenck[2] described the construction of the test, which is an adaptation of the Eysenck Personality Inventory (E.P.I.) for adults which in turn was an improved version of the Maudsley Personality Inventory (M.P.I.). A 108 item scale was drawn up by carefully selecting, adapting and re-writing items contained in the adult version of E.P.I. and adding further items. The test was administered to 6,760 school children and subsequently the 108 items of the test were inter-correlated for each age group. The principal components method of factor analysis was carried out on the matrices. The first two factors contributed much the greater part to the variance

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[1] J.L.Horn, "Significance Tests for Use with rp and Related Profile Statistics," Educational and Psychological Measurement, XXI:2, 1961, p.367.

[2] Sybil B.Eysenck, "A New Scale for Personality Measurement in Children", British Journal Educational Psychology, 35:3 (November 1965), pp.362-365.

and they were readily identifiable as neuroticism and extraversion. A lie scale of sixteen items was constructed by adapting the lie scale from the E.P.I. and adding others. This was administered to 2,777 children and factor analysed. Sixty suitable items were then chosen for the test on the basis of factor analysis. Norms for the three factors at each age were developed and are available.

In the manual of the test Sybil Eysenck[1] described extraversion as being characterised by sociability, activity, optimism, out-going and impulsive behaviour, while introversion is characterised by unsociable, passive, quiet, thoughtful and reserved behaviour. Neuroticism was typified as relating to a person who is moody, toughy, anxious, restless and rigid, whereas the stable person is calm, easy-going, carefree and reliable. A more detailed description of the nature of these two factors is presented in the Appendix (pp.409-410)

Sybil Eysenck[2] reported test - retest reliabilities for factors measured by the test. Correlation for boys in the age range covered by this study are presented in Table 1.6.

TABLE 1.6

Test Retest Reliability Coefficients for J.E.P.I.

Ages	Extraversion	Neuroticism	Lie Scale
11	.755	.869	.703
12	.768	.717	.681
13	.587	.801	.578
14	.704	.746	.645

[1]Sybil B.G.Eysenck, Manual of the Junior Eysenck Personality Inventory, London, University of London Press, 1965, p.3.

[2]Ibid, p.11.

Sybil Eysenck[1] also reported split-half reliability coefficients. Those for boys in the age group covered by this study are presented in Table 1.7.

TABLE 1.7

Split-Half Reliability Coefficients for J.E.P.I.

Ages	Extraversion	Neuroticism	Lie Scale
11	.718	.836	.669
12	.705	.841	.733
13	.778	.834	.712
14	.810	.828	.684

Sybil Eysenck[2] considered that the reliability coefficients indicate that the scales are reasonable for group comparisons at young age (e.g. 7-9) and possibly for individual testing at older ages.

The validity of the instrument was tested by administering it to two hundred and twenty-nine child guidance children who had been tested and rated with regard to the extraverted or introverted nature of their symptoms. Sybil Eysenck[3] reported that the group as a whole was very significantly above the standardization group with respect to neuroticism and that there was a very significant difference with respect to the extraversion scores between those showing extraverted symptoms and those showing introverted symptoms. She concluded:

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[1] loc.cit.

[2] Sybil B.Eysenck, "A New Scale for Personality Measurement in Children", British Journal Educational Psychology, 35.3 (November 1965), p.365.

[3] loc.cit.

> "It seems probable therefore that the scale may have some validity in connection with clinical investigations and it seems not unreasonable to expect a similar validity will attend measurements in normal children."

Since the development of the J.E.P.I. a number of studies have been reported which have used the inventory for the measurement of extraversion and neuroticism, including some referred to in this present study, for instance those by Hendry and Whiting (p. 80) and by Entwistle and Cunningham (p. 283).

Reliability tests for the present study were given to a random group of 20 boys with an interval of three weeks between tests. Correlations obtained were as follows:

Extraversion	.94
Neuroticism	.93

The results, significant at the .01 level, were considered to be satisfactory and like the reliability tests reported for H.S.P.Q. gave the researcher reasonable confidence that should changes in response be found over the longer experimental period these could be regarded as being changes in personality of the subjects.

Comparison of the Cattell and Eysenck Approach to Personality Measurement

There are certain divergences of view and of procedure between the two psychologists. These divergencies resolve themselves into difference in derivation of source traits, of factor analytic method, of nomenclature and of emphasis between primary and higher order traits.

Hall and Lindzey[1] point out that in basic derivation of source traits Cattell has preferred to use the life record method since he considers such data to be of assured significance and importance due to their origin in real life situations. The basic procedure followed is to secure a large number of behavioural ratings of different dimensions for a group of individuals and then to subject these sets of scores to factor analysis. In contrast Eysenck has tended to emphasise objective personality tests.

In their use of factor analysis Cattell and Eysenck have differed in procedure with the former using a method of simple structure and the latter a method of criterion analysis. As a consequence Cattell has extracted a larger number of primary factors which in turn contribute to higher order factors which he terms secondary factors; whilst Eysenck has typically extracted higher order factors. More recently, however, Eysenck and Eysenck[2] have reported research where following a Principle Components factorization a full scale Promax Oblique factor rotation was carried out to obtain data relating to primary factors.

With regard to nomenclature, one of the main differences between Cattell and Eysenck is that aspects of personality such as extraversion which Cattell would label as 'factor' or 'trait'[3], Eysenck classifies as a 'type' which he regards

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[1] Hall and Lindzey, op.cit., p.399.

[2] H.J.Eysenck and S.B.Eysenck, Personality Structure and Measurement, London, Routledge and Kegan Paul, 1969, pp.265-316.

[3] Raymond B.Cattell, The Scientific Analysis of Personality, Harmondsworth, Penguin Books, 1965, pp.122-123.

as a syndrome of traits, a more generalised and inclusive variety of organisation. A trait on the other hand he regards as an observed consistency among "individual action tendencies".[1]

There would appear to be little disagreement regarding the interchangeability of their measures of the higher order factor, extraversion, or exvia as Cattell prefers to call it, but until recently neither psychologist accepted that higher order factors neuroticism and anxiety were one and the same measure. Eysenck[2] did not use the two terms interchangeably. He stated:

> "Neuroticism is regarded as an inherited psychophysical disposition closely linked with the lability of the autonomic system, which governs a person's emotional reactivity and may predispose him to the development of neurotic disorders under suitable circumstances.
>
> Anxiety is a conditioned fear reaction which is particularly characteristic of dysthymic neurotics, i.e. of persons who are high on the factor of introversion, which is significantly correlated with conditionability. Anxiety therefore is a 'mixed concept' being related both to neuroticism and to introversion."

Cattell and Beloff[3] pointed out that the series of researches which led to the defining of second order factor, anxiety, have also shown that neuroticism is different from anxiety. Both neurotics and non-neurotics can scatter over a similar wide range on anxiety per se. They concluded:

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[1] H.J.Eysenck, Dimensions of Personality, London, Kegan Paul, 1947, p.18.

[2] H.J.Eysenck, "The Relationship of Neuroticism and Extraversion to Intelligence and Educational Attainment", British Journal Educational Psychology, 33.2 (June 1963), p.192.

[3] Cattell and Beloff, op.cit., p.24.

> "There is some tendency in general for neurotics to be more anxious, but anxiety is not neuroticism, and deserves to be separately measured."

However, some independent psychologists have taken a different view. Adcock[1] for instance suggested that had Eysenck continued the factorisation further factors may have been found related to neuroticism. In the event deliberate policy ensured that only broad higher order factors could be measured. He considered that Eysenck's neuroticism and Cattell's anxiety should correspond:

> "Both statistical evidence and the factor description offered by the two writers seem to indicate that this is in fact so."

Adcock[2] concluded that the major differences arise from methodology, that these are much less than might be expected and that there are no findings which cannot be reconciled. He suggested the term Emotional reactivity be substituted for Cattell's Anxiety and Eysenck's Neuroticism.

Burt[3] after pointing out that Cattell and Eysenck were primarily interested in different levels, primary source traits and second order factors respectively, and that many of the differences between them were due to this fact, stated he considered that in spite of their mutual criticisms their views were complimentary rather than antagonistic. He concluded that there was a large measure

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[1] C.J.Adcock, "A Comparison of the Concepts of Cattell and Eysenck", British Journal Educational Psychology, 35.1 (February 1965), pp.90-91.

[2] Ibid, p.96.

[3] Cyril Burt, "Factorial Studies of Personality and Their Bearing on the Work of the Teacher", British Journal Educational Psychology, 35.3 (November 1965), p.371.

of agreement between Cattell, Eysenck and himself.

Indeed more recently Eysenck and Eysenck[1] stated that Cattell prefers to call the factor which they call Neuroticism, Anxiety versus Integration or Adjustment. It would appear that they consider that the same dimension is being measured and they state that for uniformity they will refer to Cattell Anxiety as Neuroticism.

Discussing misunderstandings which have arisen in the past between their approaches to the analysis of personality Eysenck and Eysenck[2] suggest that this has largely been due to differences in methodology particularly with regard to factor analysis. They continue by stating that the two sides are now very much closer together.

> "Both sides now recognise explicitly the descriptive value of primary traits as well as the existence of type factors such as neuroticism and extraversion."

They go on to state that what is still in dispute is the usefulness of higher order factors as opposed to lower order traits.

Similarly Cattell Wagner and Cattell[3] state that because of converging techniques of Cattell and Eysenck a certain degree of common conclusion has now appeared in their work. They added:

> "The remaining points at issue between us are the sheer number of second orders and how serious for precise theoretical interpretations the amount of error may be through seeking the second orders without going through the primaries."

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[1] Eysenck and Eysenck, op.cit., p.36.

[2] Op.cit., p.41.

[3] Cattell, Wagner and Cattell, op.cit., p.41.

In the Handbook for the H.S.P.Q. the use and value of primary factors is emphasised by Cattell and Cattell.[1] Cattell[2] had earlier described his position regarding the psychological relevance and importance of first and second order factors, as being intermediate:

> ".....in that second order factors are regarded as being no more and no less psychologically meaningful and relevant than first orders but simply as necessary accounts of existing broader organising influences than those which give first order structure."

A number of researchers have recommended that Cattell's 16PF should be used for measuring second order factors rather than primaries. Becker[3] made that suggestion in the conclusion of a study where he had compared the factor structure of 16PF and Guilford personality inventories. Petersen[4] enquired into disagreements in the Cattell-Eysenck factor analytic methods of personality assessment by considering the descriptive efficiency, sufficiency of factor extraction, factor invariance and validity and concluded that:

> "Available evidence now suggests that the most dependable dimensions drawn from conventional factor analysis of ratings and questionnaires are simple familiar dimensions of broad semantic scope."

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[1] Cattell and Cattell, op.cit., p.39.

[2] R.B.Cattell, "Anxiety, Extraversion and other Second Order Personality Factors in Children", Journal of Personality, 27, 1959, p.466.

[3] Wesley C.Becker, "A Comparison of the Factor Structure and Other Properties of the 16PF and the Guilford-Martin Personality Inventories", Educational and Psychological Measurement, 2, 1961, p.403.

[4] D.R.Petersen, "Scope and Generality of Verbally Defined Personality Factors", Psychological Review, 72:1, 1965, p.48.

Rachman[1] reviewing studies of the development of personality in children concluded that the utility of a bi-dimensional model in the description and analysis of childhood personality is well established. He recommended the utilisation of the dimensions of extraversion and neuroticism particularly in developmental studies. Eysenck and Eysenck[2] summarising their work into the structure of childhood personality state that in the main their results support the view that the general principles discovered in the analysis of adult personality structure recur in the analysis of the personality structure of children, with extraversion and neuroticism being clearly apparent. They further state that the primary factors into which Extraversion and Neuroticism can be broken down are comparable to those found in adults and are similarly less consistent than are the higher order factors.

In a major analysis of the Eysenck, Cattell and Guilford Personality Inventories, Eysenck and Eysenck[3] administered the three inventories to 600 male and 600 female subjects and factor analysed the results. From this procedure they stated that only at the higher level structure did the three different systems show complete agreement.[4] They stated that the Cattell and Guilford primary factors were difficult or impossible to replicate with the Eysenck primary factors

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[1] S.Rachman "Extraversion and Neuroticism in Childhood", in Personality Structure and Measurement, London, Routledge and Kegan Paul, 1969, p.263.

[2] Eysenck and Eysenck, op.cit., p.316.

[3] Ibid, p.194.

[4] Ibid, p.328.

showing the same tendency but not to the same extent. They concluded that both for research and for practical applications higher order factors should be used rather than primary factors[1].

Comparatively recently Cattell, Wagner and Cattell[2] reported the results of an intensive statistical analysis which they made on H.S.P.Q. tests (four forms) administered to 399 girls and 401 boys from four areas of the United States. They indicated that the analysis had revealed 14 substantive primary factors. There was however some doubt regarding the meaning of three factors: C - Ego Strength, J - Coasthemia and Q_2 - Self Sufficiency. They suggested that in the case of Q_2 this may have been due to inadequate rotation in the analysis since previous studies have found Q_2 to replicate. For C and J however they suggest that they may be encountering a "systematic manifestation of unusual breadth in the trait". They indicated that examination of second order structure from the primaries yielded previously found second order factors.

It would appear at the higher order factor structure there is a good measure of agreement between these different approaches to the measurement of personality, whilst their utility in terms of assessment of primary factors has been challenged. With regard to the overall value of the Cattell and Eysenck questionnaires for research purposes Warburton and Kane[3] stated:

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[1] Ibid, p.250.

[2] Cattell, Wagner and Cattell, Op.cit., pp.39-54.

[3] Warburton and Kane, Op.cit., p.84.

> ".....the Cattell and Eysenck scales appear to be among the soundest techniques presently available. Even from the small number of investigations in the field where these scales have been used a certain amount of consistency of results is apparent. Much more corroboration is necessary and it is hoped that many more concerted efforts will be made to verify present findings and extend the scope of this important area of research."

This present research is one such concerted effort which also meets a requirement of Burt[1] who considered that we have been too easily satisfied with cross-sectional work, "What are required now are longitudinal studies..... with a view of following up well into adult life".

Strength Development

As a continuing test of strength development during the period of the study the left grip test was chosen. Bookwalter[2] described grip strength as:

> ".....one of the most reliable measures of human strength. It is a relatively economical measure, is easily administered and is a direct measure of applied force. Accordingly grip strength is a likely component of strength test batteries, a strength item in a fitness battery, or a single item reasonably representative of total body strength."

Grip strength has been extensively used in studies of strength development for example by Jones[3] in the Berkley Growth Study. With 12-14 year old boys Carter[4] obtained a

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[1] Burt, Op.cit., p.377.

[2] K.W.Bookwalter, "Grip Strength Norms for Males", Research Quarterly, 21:3 (October 1950), p.249.

[3] Jones, loc.cit.

[4] Gavin H.Carter, "Reconstruction of the Rogers Strength and Physical Fitness Indices for Upper Elementary, Junior High and Senior High School Boys", Microcarded Ph.D. Thesis, University of Oregon, 1958, p.63.

correlation of .87 between right and left grip, and with Strength Index (a battery comparable to the Total Proportional Strength battery used for matching purposes in the present study) correlation of .83 with right grip and .84 with left grip.

In anthropometry when only one of a "paired" measurement is taken this is always measured on the left side (see Hrdlicka[1]), accordingly the left grip test was selected as the measurement of changes in strength during the experimental period.

Collection of Data[2]

Preliminary Arrangements

The subjects in the study came from two sources, swimming clubs in Northumberland, Durham and Yorkshire, and schools in the same area.

The executive committees of the Northumberland and Durham Counties and Yorkshire County A.S.A. were contacted with a brief explanation of the purpose of the study, and a request for permission to approach clubs to enquire whether they would be prepared to take part. Once this clearance was received clubs were approached by means of a circular letter and a reply form, both of which are reproduced in the Appendix. With very few exceptions clubs which had boys of the age group required competing regularly, indicated their willingness to participate. Dates on which the tests were given were then mutually agreed upon. Headmasters of

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[1] Hrdlicka's, Practical Anthropometry, ed. T.D.Stewart, Philadelphia, Wistar Institute, 1947, p.203.

[2] Appendix pp.417-428 relate to procedures of data collection.

schools in comparable geographical areas to those in which the majority of participating clubs were located were then approached by individual letters with a view to obtaining their participation. These were followed up by personal visits by the researcher to those schools which indicated their willingness to co-operate. This process was continued until it was considered that a sufficient number of subjects had been obtained for the series of matching tests.

Parental permission for the boys to take part in the research was obtained by secretaries of the clubs and Headmasters of the schools. An example of the letter sent appears in the Appendix. Again only in rare cases was permission refused.

Test Procedures

In the first year of testing, for each group two sets of tests were given, on separate occasions. The first required in schools a period of approximately three hours, in all cases in two one-and-half hour sessions, and was for administration of the tests for matching purposes. In clubs, with fewer subjects being tested, each time about one-and-half hours was required. On the second visit the personality inventories were given to the groups and one-and-half hours proved sufficient time for even the slowest readers. After the first year only the second set of tests was repeated, hence one-and-half hours were required for each group tested.

The matching tests were conducted during the months of April and May 1967 for Group A and during the same months in 1968 for Group B. The experimental tests were conducted

during June and July in 1967, 1968 and 1969 for Group A and during the same months in 1968, 1969 and 1970 for Group B. The retests of each individual boy took place within a few days of a twelve month interval each time.

(i) Matching tests

The researcher gave a brief explanation of the tests to be taken and showed photographs of nationally known sportsmen to whom the researcher had previously administered the tests. It was hoped that this, together with discussions of these sportsmen, would assist in establishing the rapport necessary. It is considered that this rapport was enhanced particularly in the case of the competitive subjects by their knowledge of the researcher being a qualified A.S.A. coach. A further device to encourage the interest of the boys was to administer the tests of strength first.

Each boy was given a questionnaire/results sheet which is reproduced in the Appendix. On this were recorded the results of the physical tests, together with information such as his date of birth, parental occupation and address. These latter details were subsequently verified by club officials and teachers. The tests were then administered personally by the researcher; leg strength and back strength measured by dynamometer and left and right grip strength by manuometer according to the directions recorded by Clarke,[1] which are reproduced in the Appendix. The height and weight

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[1] H.Harrison Clarke, Application of Measurement to Health and Physical Education, 4th Edn. Englewood Clifts, N.J., Prentice-Hall Inc., 1967, pp.147-152.

of each boy was also measured and recorded.

After a break the mental ability test was then given, supervised by the researcher, according to the directions in the Test Manual[1] which are reproduced in the Appendix. This was subsequently scored following the directions in the manual.

(ii) Experimental Tests

On the second visit in the first year of testing of each group and on the visit in the second and third year of testing, the two personality inventories were administered by the researcher, according to the directions in the test manuals[2,3] which are reproduced in the Appendix. The left grip test was also administered on these occasions.

Emphasis was placed on the fact that code numbers were being used instead of subjects' names and that the results of individual responses were not being divulged to school or club authorities. It was considered that the rapport established with the subjects was such that reliance could be placed on the responses made. This was evidenced by the fact that after the initial elimination of subjects with scores of over four on the lie scale of the Junior Eysenck Personality Inventory none of the subjects then remaining in the study had to be eliminated as a result of

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[1] Otis, Op.cit., pp.2-3.

[2] Raymond B.Cattell, Manual for the High School Personality Questionnaire, Champaign, Illinois, Institute for Personality and Ability Testing, pp.5-8.

[3] Sybil B.G.Eysenck, Manual of the Junior Eysenck Personality Inventory, London, University of London Press, 1963, p.15.

their scores on the lie scale in subsequent tests. Furthermore it was considered that the atmosphere within which the tests were taken, small groups in familiar surroundings, was such that the test situation could not be considered stressful. Jacobs and Leventer[1] in a study with university students found that situational stress can affect responses to questionnaires particularly with regard to measures of anxiety and that subsequent retests, when the tests were more familiar, were conducted in a less stressful situation. However this referred to measurement of anxiety state rather than trait and as stated every effort was made to ensure that the test situation did not appear to be stressful to the boys.

On the subject of the interaction effect of the experimenter/subject relationship, Rosenthal[2] has suggested, and has presented supporting evidence for what he considers to be a justifiable conclusion, that human beings can engage in highly effective and unintended communication with each other. This he suggests, in a psychological experimental situation, may be responsible for the fulfilment of the experimenters expectancy. Whilst this may well be so it is not considered that any unintended communication could have had adverse effects in this present study since the only expectancy the researcher had of his subjects was that the questions should be answered accurately.

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[1] Alfred Jacobs and Seymour Leventer, "Response to Personality Inventories with Situational Stress", Journal of Abnormal and Social Psychology, 51, 1955, pp.449-451.

[2] Robert Rosenthal, "Covert Communication in the Psychological Experiment", Psychological Bulletin 67:5, 1967, pp.356-367.

The completed answer sheets for both personality tests were scored, following direction in the respective manuals. All the information for each subject was then recorded on a final personal results sheet, a copy of which appears in the Appendix.

Analysis of Data

Group Comparisons

Comparisons were made between the following groups.[1]

(i) Competitive (C) and Control (N)

C12 v C13	N12 v N13
C13 v C14	N13 v N14
C12 v C14	N12 v N14

with cross group comparisons:

C12 v N12

C13 v N13

C14 v N14

Separate comparisons were made for the A groups[2], the B groups[3] and the total (T) groups.[4]

(ii) Successful Competitors (SC) and Unsuccessful Competitors (UC):

SC12 v SC13	UC12 v UC13
SC13 v SC14	UC13 v UC14
SC12 v SC14	UC12 v UC14

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[1] 12, 13, 14 refer to 12 years, 13 years, 14 years of age.

[2] A groups - boys 12 years old during 1967 and tested in 1967, 1968 and 1969.

[3] B groups - boys 12 years old during 1968 and tested in 1968, 1969 and 1970.

[4] T groups = A + B groups.

with cross group comparisons:

SC12 v UC12

SC13 v UC13

SC14 v UC14

(iii) Successful Competitors (SC and Competitors who dropped out (CD):

SC12 v CD12

Unsuccessful Competitors (UC) and Competitors who dropped out:

UC12 v CD12

Personality Comparisons

Personality aspects compared were as follows:

(i) Total Personality Profile - Cattell H.S.P.Q.

(ii) 14 First Order Factors - Cattell H.S.P.Q.

(iii) 2nd Order Exvia, Anxiety, Cortertia and Independence - Cattell H.S.P.Q.

(iv) Extraversion and Neuroticism - Eysenck J.P.I.

With reference to the discussion earlier in this chapter of the approach to personality measurement by Cattell and Eysenck, emphasis is directed in this present analysis to comparisons of higher order personality factors and of total personality profiles. Primary factors are considered with respect to their relative contribution to variance between the groups being compared, in the comparison of total personality profile.

Physical Development

Left Grip Strength test.

Comparison of Subjects Initially Scoring High or Low on the Higher Order Personality Factors

Since group analyses inevitably mask individual variations in response it was decided to analyse further the higher order personality factor data by comparing the results of competitors who initially at 12 years of age scored either high or low on these factors.

(i) Cattell H.S.P.Q. factors Exvia, Anxiety, Cortertia, Independence.

Competitors and Control subjects who initially were above or below one standard deviation from the mean score of the group on the factor. For each of the four factors comparisons were made as follows:

Competitors initially scoring high (CIH)	Controls initially scoring high (NIH)
CIH12 v CIH13	NIH12 v NIH13
CIH13 v CIH14	NIH13 v NIH14
CIH12 v CIH14	NIH12 v NIH14

with cross group comparisons:

CIH12 v NIH12

CIH13 v NIH13

CIH14 v NIH14

Comparable comparisons were also made between Competitors initially scoring low CIL and Controls initially scoring low NIL.

(ii) Eysenck J.P.I. - Extraversion and Neuroticism.

Eysenck[1] has stressed the desirability of a two

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[1] H.J.Eysenck, Fact and Fiction in Psychology, Harmondsworth, Penguin Books, 1965, p.54.

dimensional description of personality. Such an analysis was made in this study of subjects, both competitors and controls, who initially had high or low scores in both extraversion and neuroticism. After plotting the initial scores on a two dimensional graph, those subjects lying one half of a standard deviation from the group mean on both extraversion and neuroticism were classified as follows:

High Extraversion, High Neuroticism HEHN

High Extraversion, Low Neuroticism HELN

Low Extraversion, High Neuroticism LEHN

Low Extraversion, Low Neuroticism LELN

with the prefix C or N again indicating competitive and control groups.

Except for the LELN group where numbers were not considered to be sufficient to justify comparisons to be made each variable was then analysed in turn, for example,

Extraversion:

CHEHN12 v CHEHN13

CHEHN13 v CHEHN14

CHEHN12 v CHEHN14

Comparisons were then repeated with data from the Control group and then from both Competitors and Control in HELN and LEHN.

Comparisons of Questionnaires

Correlation between results of Cattell Exvia and Eysenck Extraversion and between Cattell Anxiety and Eysenck Neuroticism were made for both Competitive and Control groups at 12 years, 13 years and 14 years.

Method of Scoring

In the case of the Total Personality Profile and the fourteen first order personality factors measured by H.S.P.Q., comparisons were made using raw scores as recommended in the Test Handbook[1]. Comparison of Eysenck's Extraversion and Neuroticism results were similarly made in raw scores.[2] Cattell and Cattell[3] give details of changes in trait scores due to biological and cultural growth of personality and suggest that in some researches adjustment of scores will be necessary. In this study such adjustments were not made since in considering changes in factor scores within groups the researcher wished to know the actual real changes that occurred, both developmental changes and conditional changes (that is, changes, if any, brought about by the competitive environment). These latter would be brought out in the between group analyses since any developmental changes must be considered to be common to both groups. Due consideration of the normally expected age changes in factor scores is given in the discussion of statistical analyses.

Comparisons of Cattell's 2nd Order factors, Exvia, Anxiety, Cortertia and Independence, were made using derived sten scores. Raw scores on first order factors were first converted to n stens by reference to tables in the test

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[1]Cattell and Cattell, Op.cit., p.19.

[2]Individual scores on H.S.P.Q. and J.E.P.I. are recorded in the Appendix in Tables 8.1 to 8.26.

[3]Cattell and Cattell, op.cit., pp.24-25.

supplement[1] and then weighted following Cattell and Cattell[2] (see Table 11.1 in the Appendix).

Statistical Procedures Used

(i) Multiple Discriminant Analysis

This procedure was used for comparisons on the Total Personality Profile and the first order personality factors. Procedures used followed Cooley and Lohnes[3]. Using this method comparisons can be made on the total personality profile since the technique considers the relationship between variables, the variability of group means and the individual variability about group means on all variables. The number of discriminant functions is normally the number of groups minus one. In all the comparisons in this study two groups were involved hence one discriminant function was calculated. To test whether the eigenvalue (latent root) obtained was significantly different from zero the Chi Square test after Rao[4] was applied.

$$\text{Chi Square} = (N - \tfrac{1}{2}(p + k) \log_e (1 + \text{eigenvalue})$$

where N = Total sample size of both groups combined.

p = Number of variables.

k = Number of groups.

df = p(k - 1)

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[1] R.B.Cattell, Tabular Supplement with Norms for H.S.P.Q. Champaign, Illinois, Institute of Personality and Ability Testing, 1968, p.7.

[2] Cattell and Cattell, op.cit., p.41.

[3] William W.Cooley and Paul R.Lohnes, Multivariate Procedures for the Behavioural Sciences, New York, John Wiley and Sons, 1962, p.118, pp.127-130.

[4] C.R.Rao, Advanced Statistical Methods in Biometric Research, New York, John Wiley and Sons, 1952, p.373.

Wilk's Lambda criterion for the discriminating power of the test battery is derived as a function of the latent root. This was tested for significance by converting to an F by the technique developed by Rao[1] as detailed by Cooley and Lohnes[2] with df p and (N - p - 1), where N = Total sample size of both groups combined, and p = Number of variables.

Wilk's Lambda is recommended by Cooley and Lohnes[3] as being the most useful test of the discriminating function. Scaled vectors are calculated and these show the relative contribution of the fourteen first order variables to the discriminant function.[4] Through this method of Multiple Discriminant Analysis therefore both total personality profile and each separate personality factor are analysed.

Standard IBM computer programmes were used for this analysis, the programme code names being DISCRIM, CORREL, DIRNM, HDAIG, MPRINT and MPUNCH. Computations were conducted by the staff of the University of Durham Computer Unit under the direction of Mr.A.A.Young, Computer Supervisor, using the IBM 360/67 computer at the Centre.

The discriminant function has been described by Fisher[5] as being a unit vector specifying the direction of one

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[1] Rao, op.cit., pp.258-266.

[2] Cooley and Lohnes, op.cit., p.125.

[3] Ibid, p.7.

[4] See Appendix p.309 for note on interpratation.

[5] R.A.Fisher, The Statistical Utilization of Multiple Measurements, Annals of Eugenics, 1938:8, p.381.

population from another and Morrison[1] stated that the actual linear compound with the greatest critical ratio is called the linear discriminant function. Snedecor and Cochran[2] refer to this statistic as being a multivariate technique for studying the extent to which different populations either overlap or diverge. They give three principle uses, two of which apply to this study, namely to study the relationship between populations and:

> "As a multivariate generalisation of the t test. Given a number of related measurements made on each of two groups the investigator may want a single test of the null hypothesis that the two populations have the same mean with respect to all measurements."

The early development of the Discriminant Function Analysis in the 1930s has been attributed by Snedecor and Cochran[3] to Fisher, to Mahalanohis and to Hotelling who produced the multivariate T test. Eysenck[4] also mentions Wilks as one of the early workers in the area. Developments and refinements of the technique have followed, descriptions of which can be found in the work of researchers such as Bartlett,[5]

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[1]Donald A.Morrison, Multivariate Statistical Methods, New York, McGraw Hill, 1967, p.130.

[2]G.W.Snedecor and W.G.Cochran, Statistical Methods, 6th Ed., Ames, Iowa, University of Iowa Press, 19, p.414.

[3]Loc.cit.

[4]H.J.Eysenck, The Dynamics of Anxiety and Hysteria, London, Routledge and Kegan Paul, 1957, pp.16-17.

[5]M.S.Bartlett, Multivariate Analysis, Journal of Royal Statistical Society IX, 1947, pp.176-197.

Rao[1] and Maxwell[2]. A comprehensive treatment of the basic methods used in Multiple Discriminant Analysis may be found in Cooley and Lohnes[3].

The use of Multiple Discriminant Analysis for personality profiles was recommended by Kroll and Petersen[4] in a personality study of collegiate football teams. Kroll[5] again used the technique in a personality study of collegiate wrestlers and Kroll and Carlson[6] used Multiple Discriminant Analysis for a personality study of Karate participants. Loy[7] also used this method of analysis in his study of swimming coaches. Kane[8] used a multivariate analysis in personality description of soccer ability and Kane[9] again

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[1]C.R.Rao, Tests of Signficance in Multivariate Analysis, Biometricka, 35, 1948, pp.58-70.

[2]A.E.Maxwell, Canonical Variate Analysis when the Variates are Dichotomous, Journal of Education and Psychological Measurement, XXI, 2, 1961, pp.259-271.

[3]Cooley and Lohnes, op.cit., pp.1-16 and pp.116-134.

[4]Walter Kroll, and Kay Petersen, Personality Profiles of Collegiate Football Teams, Research Quarterly, 36:4, (December 1965), p.443.

[5]Walter Kroll, Sixteen Personality Profiles of Collegiate Wrestlers, Research Quarterly, 37:1 (March 1967), p.49.

[6]Walter Kroll and B.Robert Carlson, Discriminate Function and Hierarchial Grouping of Karate Participants, Research Quarterly, 38:3 (October 1967), pp.405-411.

[7]John W.Loy, Socio-Psychological Attributes of English Swimming Coaches Differentially Adopting a New Technology, Microcarded Ph.D. Dissertation, University of Wisconsin, 1967, p.187.

[8]John E.Kane, Personality Description of Soccer Ability in Research in Physical Education Vol.1 No.1, (October 1966), Ed. J.Wyn Owen, London, P.E.A., pp.54-64.

[9]John E.Kane, Personality in Relation to Physical Abilities and Physique, Ph.D. Thesis, University of London, 1968, p.222.

made use of the statistic in a study of personality in relation to physical abilities and physique.

The test of discrimination used in the studies cited has been Wilks Lambda except in the case of Kane's studies where Mahalanobis D^2 test was used. The use of Multiple Discriminant Analysis would therefore appear to be well established in research comparable to that of the present study. As indicated alternative computational procedures are available.

(ii) Analysis of Variance

Analysis of Variance techniques were used to test the significance of the difference between means of the following variables: Cattell's Exvia, Anxiety, Cortertia and Independence, Eysenck's Extraversion and Neuroticism and for the left grip strength test. Three different techniques were used according to the comparisons being made.

(a) One way Analysis of Variance for comparison of correlated groups.

Procedures followed Garrett[1] and this technique was used for comparison of scores from tests administered twice to the same group as below:

C12 v C13	N12 v N13	SC12 v SC13	UC12 v UC13
C13 v C14	N13 v N14	SC13 v SC14	UC13 v UC14
C12 v C14	N12 v N14	SC12 v SC14	UC12 v UC14

and for all the within group comparisons in the analysis of initial high and low scoring competitive and control groups on the higher order personality factors.

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[1] Henry E.Garrett, Statistics in Psychology and Education, 5th Edn., New York, Longmans Green, 1958, pp.291-295.

The obtained F ratios were tested for significance with df = k - 1 and (k - 1)(N - 1) where k = number of trials and N = Number of subjects.

(b) One way Analysis of Variance for comparisons of Non-Correlated Groups.

Procedures followed Garrett[1] and this technique was used for comparisons between two different groups as below:

C12 v N12

SC12 v UC12

CR12 v CD12

and for comparisons at 12 years of competitive and control groups initially scoring high or low on Cattell's 2nd order factors.

The obtained F ratios were tested for significance with df k - 1 and N - k where k = number of groups and N = Total number of subjects.

(c) Analysis of Co-variance for comparison of Non-Correlated Groups.

Procedures followed Garrett[2] and this technique was used for comparisons between two different groups at 13 years of age and at 14 years of age. This technique takes into account any initial differences in scores of the groups, i.e. at 12 years of age. This technique was used to compare the following groups:

C13 v N13	SC13 v UC13
C14 v N14	SC14 v UC14

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[1] Ibid., pp.289-291.

[2] Ibid., pp.295-303.

and for comparisons at 13 years and at 14 years of competitive and control groups initially scoring high or low on Cattell's 2nd order factors.

The obtained F ratios were tested for significance with df k - 1 and (N - k) - 1 where k = number of groups and N = Total number of subjects.[1]

All the analyses of variance were comparisons of groups of equal numbers except for the comparison of SC12 v CD12 and UC12 v CD12.

The analyses of variance computations were carried out by the researcher on an Olivetti Programma 101 Computer at St. Luke's College, Exeter. Operational procedures followed the computer manual instructions.[2] The programmes were written in Olivetti Machine Code by Mr.M.E.Wardle, Senior Lecturer in Mathematics at St. Luke's College, and were checked with data from Garrett[3] prior to being used for the present research data.

A further check was made by comparing t ratios obtained by processing three sets of data from the A group through the University of Durham IBM 360/67 computer, using a standard programme, with F ratios computed on the Programma 101 computer. Comparative results were as follows:

		t	t^2	F
Eysenck Extraversion	C12 v N12	0.91	0.82	0.83
Eysenck Neuroticism	C13 v N13	2.09	4.37	4.36
Left Grip Test	C14 v N14	2.16	4.67	4.68

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[1] Ibid., p.194.

[2] Olivetti, Programma 101 Self Instruction Manual, 1968, p.136.

[3] Garrett, op.cit., pp.225, 227, 291-292, 296-298.

Since t is the square root of F the value of t^2 and F should be equivalent; which in fact they are, the very slight discrepancies being due to differences in rounding off in the two calculations.

Box[1] has shown that in studies where group sizes are equal or not very different the analysis of variance test is very little affected by variance inequalities. He further points out that since the test is known to be very insensitive to non normality it can safely be used under most practical conditions.

The Analyses of Variance techniques have been extensively used in the analysis of results in research studies of a comparable nature to the present one and where univariate techniques have been required. Several of the studies referred to in Chapter 2 used these methods for the analysis of results.

(d) Product Moment Correlations.

This technique was used to determine the degree of relationship between Cattell's Exvia and Eysenck's Extraversion and Cattell's Anxiety and Eysenck's Neuroticism.

Correlations were computed on the data of C12, C13, C14, N12, N13, and N14. Procedures followed Garrett.[2]

A standard IBM programme was used and the computations were carried out by the staff of the Computer Centre at the University of Durham on an IBM 360/67 computer.

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[1] G.E.P.Box, "Non Normality and Tests on Variances", Biometrika, 40, 1953, p.333.

[2] Ibid., p.142.

The obtained correlations were tested for significance with df of N - 2 where N = number of subjects.

Levels of Significance

The obtained Chi Squares, F ratios and correlations were tested for significance against the null hypothesis by entering Tables E, F and 25 respectively in Garrett,[1] with the appropriate degrees of freedom. Levels of significance used were .05 and .01 (see Garrett[2]).

Personality Traits and their Desirability

In the analysis of the data and the ensuing discussion of the results obtained in the study value judgements are given with regard to whether the shift in trait direction is a desirable one or not. Such judgements inevitably depend upon the frame of reference within which the term desirable is used. For instance a shift towards introversion could be regarded as being undesirable in relation to social contacts since unsociability is usually regarded as being a characteristic response of the introvert, on the other hand it could be regarded as being a desirable shift in the context of scholastic attainments where the trait has been linked with higher attainment.[3]

As a generalisation then where the term desirable is applied to a shift in trait direction it will be used with reference to good mental health. Even here there is some

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[1] Ibid., pp.450, 451-454, 201.

[2] Ibid., p.216.

[3] See pages 283-284.

difficulty since as Layman[1] has pointed out definitions of mental health vary. Her own summary of the attributes of the mentally healthy person, however, seems to cover most aspects; she stated that these are:

> "peace of mind, relative freedom from tension and anxiety, a feeling of security, a sense of self worth, the ability to deal constructively with reality, enjoyment of human contacts, the capacity for mutual satisfaction in human relationships, integration around socially useful values, flexibility, an appropriate balance between self sufficiency and willingness to accept the help of others, the capacity to give and receive affection, the ability to direct hostile feelings into creative and constructive channels, the ability to accept present frustration for future gain, spontaneity and the capacity to enjoy life."

In this context then one could regard increase in extraversion more desirable than decrease provided that such increase was not extreme, reduction in anxiety more desirable than increase - a case could be made however for the necessity of some level of anxiety, complete lack would be likely to lead to foolhardy and injurious activities. Increase in Cortertia is clearly desirable as is increase in Independence provided it is not extreme.

Shifts in primary personality factor scores in a positive direction (increase in score) which would be considered desirable are those of factors:

B - Intelligence C - Ego Strength

whilst increases in the following factors would be considered desirable provided they were not to the extreme

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[1] E.M.Layman, "Contributions of Exercise and Sports to Mental Health and Social Adjustment" in Science and Medicine of Exercise and Sports, ed. W.R.Johnson, New York, Harper Bros., 1960, p.563.

positive pole:

A - Affectothymia	E - Dominance
F - Surgency	G - Super Ego Strength
H - Parmia	Q_2- Self Sufficiency
Q_3- Self Sentiment	

A desirable shift in reduced factor score would be for Q_4 - Ergic Tension and, providing the scores did not reach extreme negative poles, D - Excitability, I - Harria, J - Zeppia and O - Untroubled Adequacy.

CHAPTER IV

RESULTS OF THE STUDY

In this chapter the results of the experimental part of the study are presented, discussed and related to previous studies where applicable. Where such references are made the page number after the author's name indicate the pages in this thesis where the reference occurs.

For the various analyses made more than sixty tables of results were prepared and it was therefore decided to place these in the Appendix and include only summary tables in the chapter. Scores for each individual subject on the matching and experimental tests are also presented in tabular form in the Appendix, (pp.362-393).

The results are presented in four main sections as below:

1. Competitive and Control Groups.
   Tables relevant to the comparisons made of these groups are 2.1 to 2.10 in the chapter and 5.1 to 5.36 in the Appendix, (pp.310-342).
2. Successful and Unsuccessful Competitive Groups.
   Tables 3.1 to 3.4 in the chapter and 6.1 to 6.12 in the Appendix, (pp.343-353).
3. Competitive Drop Out Group.
   Tables 7.1 to 7.16 in the Appendix, (pp.354-361).

4. Comparison of Results from H.S.P.Q. (Cattell) and J.E.P.I. (Eysenck).

Tables 4.1 and 4.2 in the chapter.

In sections 1 - 3 the results are analysed in the following order:

(i) H.S.P.Q. Total Personality Profile and Primary Factors.

(ii) H.S.P.Q. 2nd Order Factors.

(iii) J.E.P.I. variables.

(iv) Strength test.

Throughout the presentation of results in order to avoid undue repetition the same procedure is adopted as was followed in Chapter 2 with the term "significance" indicating the .05 level of confidence and higher levels being placed in brackets after the term.

1. Competitive and Control Groups

H.S.P.Q. Total Personality Profile and Primary Factors

Tables 5.1 to 5.6 in the Appendix list the means and standard deviations of the fourteen primary personality factors measured by H.S.P.Q., for Competitive and Control groups A, B and T at 12, 13 and 14 years.[1] Tables 5.7 to 5.15 in the Appendix detail the obtained results from the Multiple Discriminant Analyses by which comparisons of the total personality profile were made within and between Competitive

[1] A Group - Boys born in 1955; B Group - Boys born in 1956; T Group - A + B Groups.

and Control groups. Included in these tables are the chi square values of the obtained eigenvalues and their levels of significance and the F ratio values of the obtained Wilks Lambda and their levels of significance. The contribution each primary factor makes to the discriminant function of any two profiles can be determined by reference to the scaled vectors which are also included in these tables. The vectors with the highest values are those which contribute most to the discriminant function.

Summaries of the Multiple Discriminant Analyses are given in tables 2.1, 2.2 and 2.3 in this chapter. These indicate levels of significance of the obtained eigenvalues and Wilks Lambda and also indicate those primary factors with the greatest contribution to discriminant functions which reached .05 or .01 levels of significance. The signs + and - indicate higher or lower mean scores at the upper age in comparisons of within group profiles and for the competitive group in comparisons of between group profiles.

Competitive Groups

TABLE 2.1

H.S.P.Q. Total Personality Profile of Competitive Groups:

Summary of Multiple Discriminant Analyses

	C12 v C13			C13 v C14			C12 v C14		
	A	B	T	A	B	T	A	B	T
Eigenvalue	NS	NS	NS	NS	.05	.05	.01	.01	.01
Wilks Lambda	NS	NS	NS	NS	.05	.05	.02	.01	.01
Main contribution to significant function									
A							+		+
B					+	+	+	+	+
C						+	+		
D						-	-	-	-
E					+	+	+	+	+
F									
G									+
H					-			+	
I									
J									
O					-	-	-		-
Q_2									
Q_3						-	-		
Q_4									

There were no significant discriminant functions for the personality profiles of either A, B or T Competitive groups when they were compared at 12 and 13 years of age.

The comparison of the profiles at the beginning and end of the second year of competition within the study, i.e. at ages 13 and 14 years gave a non significant function for the A group but both the B and the T groups had significant eigenvalues and Lambdas.

Comparison of the profiles at 12 years and at 14 years revealed significant (.01) differences for all the competitive groups (the lambda for the A group did not quite reach the .01 level being at .02).

These results indicated that groups of boys involved in a competitive swimming environment do change in total personality profile with greatest change being shown over a longer period of involvement in the environment.

Recurring primary factors which contributed most to the significant discriminant functions were A - Affectothymia, B - Intelligence, C - Ego Strength and E - Dominance, all with higher mean scores at the older age. Factor G - Super Ego Strength was also an important contributor to the significant discriminant function of the total competitive group between ages 12 and 14. Two factors which also contributed highly to the significant discriminant functions but which had lower mean scores at the higher age were D - Excitability and O - Guilt Proneness.

These changes were all in the expected direction but were much more pronounced than the changes which Cattell and Cattell[1] had indicated would normally be expected over this age range.

The implication from these results is that over the age period with which this study was concerned, boys participating in a competitive swimming environment are likely

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[1]Raymond B.Cattell and Mary D.L.Cattell, Handbook for the Jr.-Sr. High School Personality Questionnaire, Champaign, Institute for Personality and Ability Testing, 1969, p.24.

to show changes in personality and to become more outgoing, generally brighter, more emotionally stable, more assertive or competitive (as one might expect) and become more conscientious, at the same time becoming less excitable and less apprehensive.

Control Groups

TABLE 2.2

H.S.P.Q. Total Personality Profile of Control Groups:

Summary of Multiple Discriminant Analyses

	N12 v N13			N13 v N14			N12 v N14		
	A	B	T	A	B	T	A	B	T
Eigenvalue	NS	NS	NS	NS	NS	NS	NS	NS	.01
Wilks Lambda	NS	NS	AS	NS	NS	NS	NS	NS	.01
Main contribution to significant function									
A									+
B									+
C									
D									
E									+
F									
G									
H									
I									
J									
O									
Q_2									-
Q_3									-
Q_4									

Comparisons of the total personality profiles did not reveal any significant discriminant functions for either A, B or T Control groups between ages 12-13 years or 13-14 years.

The only significant discriminant function obtained in all the analyses of the control group was for the total T group in the comparison of 12 and 14 year old profiles, when the eigenvalue and lambda reached the .01 level. The values for the A group between the same ages almost reached the .05 level.

These results indicated that over the total period of the study the control group of boys who were non participants in individual competitive sport did evidence some change in total personality profile but the changes were not so marked as was the case with the competitive group.

The primary factors which contributed most to the one significant discriminant function obtained were A - Affectothymia, B - Intelligence and E - Dominance, all with higher mean scores at the higher age of 14 years. These three factors were also a feature of the significant functions in the analyses of the competitive groups and again were in the normally expected direction of change but more pronounced, particularly in the case of A and E. Two other factors also had high weightings on the significant function of the control group but this time with lower mean scores at the upper age, these were Q_2 - Group Dependency and Q_3 - Low Self Sentiment Integration.

Over the total period of the study the obtained results indicated that the control group became more outgoing,

generally brighter, more assertive, more group dependent and less controlled.

Competitive v Control Groups

TABLE 2.3

H.S.P.Q. Total Personality Profile: Summary of Multiple Discriminant Analyses of Competitive and Control Groups at 12, 13 and 14 Years

	C12 v N12			C13 v N13			C14 v N14		
	A	B	T	A	B	T	A	B	T
Eigenvalue	NS	NS	NS	NS	NS	.01	.01	NS	.01
Wilks Lambda	NS	NS	NS	NS	NS	.01	.01	NS	.01
Main contribution to significant function									
A									
B									
C						+	+		+
D						-	-		-
E						+			+
F							+		
G									+
H						+			
I									
J									
O							-		-
Q_2									
Q_3						+	+		
Q_4						-	-		

At the commencement of the study the total personality profiles of Competitive and Control groups A, B and T, i.e. at 12 years of age, were not significantly different.

At 13 years comparisons of the A groups and of the B groups similarly revealed non significant functions but for the total T groups the eigenvalue and lambda had significant (.01) values.

At 14 years of age there were significant (.01) values between the A groups and between the T groups whilst the values for the B groups were just below .05.

From the within group analyses of the Competitive and Control groups earlier in this chapter it was clear that whilst both groups did show change in personality profile during the course of the study greater changes were evidenced by the competitive group. This was confirmed by the between group analyses since the groups did not differ significantly at 12 years but by 14 years the profiles had become significantly (.01) different. Recurring primary factors with highest loadings on the significant discriminant functions were C - Ego Strength, E - Dominance, Q_3 - High Strength of Self Sentiment, all with higher mean scores favouring the Competitive groups, together with L - Excitability, O - Guilt Proneness and Q_4 - Low Ergic Tension, these latter three factors having lower mean scores by the Competitive groups.

These results therefore suggest that the groups of boys who were involved in individual competitive swimming and who at 12 years had comparable total personality profiles to those of the Control groups changed in aspects of personality to a greater extent than did the non-competitive control groups, by the age of 14. The changes were such that the

Competitive groups displayed greater emotional stability, were more assertive, more controlled, less excitable, less apprehensive and were less tense than the Control Groups.

The findings of this study are contrary to those reported by Kane (p.112) who found no significant function which discriminated between the personality profiles of a group of adult students engaging in physical pursuits over a three year college period. Whilst the measuring instruments were comparable - H.S.P.Q. and 16PF and both sets of results were analysed by multiple discriminant analysis, the criterion groups were not directly comparable, in particular the age range of subjects in this present study is one during which one might reasonably expect personality to be moulded more than at young adult age.

H.S.P.Q. 2nd Order Factors

Tables 5.16, 5.19, 5.22 and 5.25 in the Appendix list the mean and standard deviation n sten scores for the Competitive and Control groups on four second order factors. The same tables also list the F ratio values for the Analyses of Variance for the comparisons at 12, 13 and 14 years, within and between Competitive and Control groups. Summaries of the significance values of the Analyses of Variance of factors Exvia, Anxiety, Cortertia and Independence are given in this chapter in Tables 2.4 to 2.7 respectively. In these tables the signs + or - indicate higher or lower mean scores at the upper age in the case of the within group comparisons and for the Competitive group in the case of the comparisons between Competitive and Control groups.

(i) Q_{II} Exvia - Invia

(a) Competitive and Control Groups A, B and T

TABLE 2.4

F Ratio Levels of Significance for Exvia Scores of Competitive and Control Groups at 12, 13 and 14 Years

	A	B	T
C12 v C13	+ NS	+.01	+.01
C13 v C14	+.01	+ NS	+.01
C12 v C14	+.01	+.01	+.01
N12 v N13	+ NS	+ NS	+ NS
N13 v N14	+ NS	+ NS	+ NS
N12 v N14	+ NS	+.01	+.01
C12 v N12	+.05	+ NS	+.05
C13 v N13	+.01	+.01	+.01
C14 v N14	+.01	+.05	+.01

Competitive Group

The majority of the comparisons of mean scores within the competitive group yielded significant (.01) increases in Exvia scores. For the A group there was not a significant gain between 12 and 13 years but between 13 and 14 the gain was at the .01 level as was the overall gain between 12 and 14 years. The B group also displayed an overall gain at the .01 level between 12 and 14 years but in this case there was a significant (.01) gain between 12 and 13 whilst the increase from 13 to 14 did not reach a significant level. With the total T group there were significant (.01) gains throughout, both at one year intervals and between 12 and 14 years. It would appear then that boys participating in a programme of age group swimming over a period of three

seasons are likely to show increased tendencies towards extraverted behaviour although any particular sub group may not display marked differences over a one year period.

Control Group

In marked contrast to the Competitive group none of the single year comparisons of Exvia scores i.e. 12-13 and 13-14 for either A, B or T groups yielded significant changes. With the A group the comparisons of scores at 12 and 14 years showed non significant results. However, both the B and the T groups did have significant (.01) gains from the age of 12 to 14 years. The inference would be then that whilst Exvia scores of the control group did increase the increases were less marked than were those of the competitive group and a longer period of time elapsed before significant gains were shown.

Competitive v Control Groups

All but one of the comparisons of Exvia scores between competitive and control groups showed significant differences with the competitive group having the higher mean score. At 12 years of age the Competitive A and T groups were significantly higher, the differences between the B group scores whilst still higher in the case of the competitive group did not reach a significant level.

At 13 years the differences were all at the .01 level as was also the case at 14 years for the A and T groups whilst for the B group the difference was significant at the .05 level.

It should be pointed out that no attempt was made to equate competitive and control groups on personality factors initially and it was quite conceivable that there would prove to be differences at the earlier age. However because of the statistical procedures used it is apparent that whilst there were differences in Exvia level between the two groups at the commencement of the study the differences grew wider as the study continued with the competitive group becoming markedly more extravert.. What the analysis cannot reveal however is whether the higher level of Exvia evidenced by the competitive group at 12 years was due to the boys having already been within the competitive environment for some time or whether it was the case that boys already somewhat high on the Exvia trait were more likely to be those attracted to the competitive environment. Possible reasons for this could be those suggested in Chapter 2 (see pages 53-61) that the extravert is better able to withstand the physical discomfort which is associated with racing and training and is more persistent in repetitive physical tasks. If this is the case there could already have been a degree of natural selection with the less extravert boy having already dropped out of the competitive scene.

The findings relating to 2nd Order Exvia tend to replicate the results of Primary Factor E - Dominance in the Multiple Discriminant Analysis. Factor E is one of the highest loading factors to 2nd Order Exvia and proved to be a consistently high weighted factor to the significant discriminant functions of the competitive group. It was

present along with Factor A - Affectothymia, another high loading primary factor to 2nd Order Exvia, in the only significant discriminant function of the control group, i.e. for the total group between ages 12-14. Factor E also recurred with high weightings in the significant discriminant functions between competitive and control groups at 13 and 14 years.

The results of this study regarding the higher Exvia level of competitors aged 12-14 are comparable to those found by Herbert (p.75) and by Kane (p.76) with team game players of a similar age and by Schendel (p.71) with 15 year old competitors if one accepts that Class 1 of the California Psychological Inventory is largely a measure of extraversion. Reported research on individual competitive sport in Chapter 2 mainly relates to a higher level of performance than that of the total competitive group of this study. The results however were very comparable to those of Warburton and Kane (p.79) with Young Athletes and of Hardman (p.106) with Olympic swimmers.

On the whole the results from previous studies in the comparison of Exvia level of competitors with non competitors or with norms are very much in line with those revealed in this study. The change noted in the competitive group over the period of the study supports the assertion of Cagigal (p.32) that there can be a lessening of introverted tendencies evidenced by participants in competitive sport.

(b) Competitive and Control Groups Initially Scoring High on Exvia

Competitive Group

There were no significant differences recorded in mean Exvia scores in comparison between 12-13, 13-14 or 12-14 years of age.

Control Group

Like the Competitive group there were no significant differences recorded by the Control group for the three comparisons made.

Competitive v Control Groups

None of the between group comparisons at 12, 13 or 14 years revealed significant differences.

The implication from these analyses is that for those boys who early in their competitive swimming careers already have high Exvia scores, continued association with the competitive environment has no noticeable effect on these scores. This contrasts with the results obtained for the total competitive group which indicated a continuous and significant rise in Exvia level during the course of the study, however one might expect that those already high on the factor would not substantially increase their scores.

(c) Competitive and Control Groups Initially Scoring Low on Exvia

Competitive Group

The Competitive group recorded an overall mean gain between 12 and 14 years which was significant at the .01 level.

Control Group

Although the Control group had a significant (.01) rise during the first year this gain was not maintained throughout the study and the overall result was a non significant one.

Competitive v Control Groups

The differences between means was not significant at 12 years but at both 13 years and at 14 years of age the Competitive group had significantly higher mean scores.

These results suggest that there is more likelihood of boys who at 12 were low scorers on Exvia, increasing their Exvia levels if they are participating in a competitive swimming environment than if they are non competitive boys as defined in this study. The results compare favourably with those obtained for the total competitive group where an increase at the .01 level of significance was recorded between ages 12-14. In contrast the low scoring Controls seem less likely to improve their level of Exvia - the total Control group had in fact shown a significant (.01) rise between 12 and 14 years.

If in fact as is suggested competitive boys who at 12 years are markedly socially withdrawn, become much more outgoing, at least in part as a result of their participation in competitive sport, then it is the involvement to which this can be attributed and it is not simply due to successful participation, since a comparison of membership of the Initially Low Exvia group with the Successful Competitive group revealed that only four of the seventeen were classified as successful.

(d) Summary

The results from the comparisons of mean Exvia scores made above seem to indicate that involvement in competitive swimming does encourage the development of higher levels of Exvia to a greater degree than is the case with non competitive groups of boys. This also applies to those members of the competitive group who initially had very low scores on this factor but for those competitors who initially scored high on the factor continued association with a competitive environment had no effect on Exvia level.

The results of the total group comparisons substantiated those earlier reviewed in the comparison of total personality profile by multiple discriminant analysis and showed resemblance to previous studies of schoolboy team game players in respect to a higher level of Exvia displayed by the competitors.

(ii) Q_{II} Anxiety

(a) Competitive and Control Groups A, B and T

TABLE 2.5

F Ratio Levels of Significance for Anxiety Scores of Competitive and Control Groups at 12, 13 and 14 years

	A	B	T
C12 v C13	+ NS	- NS	- NS
C13 v C14	-.05	- NS	- NS
C12 v C14	- NS	- NS	- NS
N12 v N13	+ NS	+ NS	+.05
N13 v N14	+ NS	- NS	+ NS
N12 v N14	+.05	+ NS	+.05
C12 v N12	-.01	-.05	-.01
C13 v N13	-.01	-.01	-.01
C14 v N14	-.01	-.05	-.01

Competitive Groups

With the exception of a small rise of 0.14 n sten between the ages of 12 and 13 years by Competitive Group A all the comparisons within the Competitive Groups displayed reductions in mean Anxiety scores as the boys grew older. However only one difference between mean scores reached significance this being the comparison between 13 and 14 years of the A group. The concensus of these results therefore suggest that Anxiety levels in the Competitive Groups remained largely unchanged during the course of the study and whilst they were engaged in a competitive environment.

Control Groups

In contrast to the results obtained in the analysis of the Competitive Groups those for the Control Groups indicated rises in mean Anxiety scores in all the comparisons except for that of the B group between the ages of 13 and 14 when there was a slight reduction of 0.21 n sten. Significant rises were recorded by the A group between the ages of 12 and 14 years and by the T group between the ages of 12 and 13 and 12 and 14 years.

The indication then is of a rising Anxiety level by the Control groups between the ages of 12 and 14 years.

Competitive v Control Groups

At the commencement of the study at 12 years of age there were already significant differences in Anxiety levels

between the Competitive and Control groups with the Competitive group having the lower mean score. The differences for the A groups was at the .01 level as was the difference for the T groups whilst that for the B groups was .05.

With analysis of covariance techniques taking into account these initial differences between the means, the differences between all three groups at 13 years was at the .01 level of significance as were those for the A and T groups at 14 years with the .05 level between the B groups. In all cases the Competitive groups had the lower mean score.

There was no means of determining in this study whether the lower initial Anxiety level was due to previous association with a competitive environment by boys in the Competitive groups or whether it was a case that competitive swimming attracted boys who had lower levels on the Anxiety trait. What was portrayed however was that during continued association with the competitive environment the gap in Anxiety level between the Competitive and Control groups widened with significant increases in mean Anxiety scores of the Control group. In Chapter 2 the question was posed whether constant association with anxiety provoking states in competitive situations would have any effect on anxiety as a trait. The evidence from this study suggests that anxiety as a trait is not increased and if anything is reduced, supporting the view put forward that the competitive situation provides an opportunity for learning how to sublimate anxiety (p.43). These results to a certain extent also support Cureton's (p.43) research findings

regarding the reduction of anxiety through physical activity and conditioning.

The findings of the analysis of second order Anxiety support those of the Multiple Discriminant Analysis earlier in this chapter where it was shown that the Competitive group were lower on Factor O- Guilt Proneness and higher on Factor Q_3 - High Strength of Self Sentiment. These are the two primary factors with highest loadings on second order Anxiety, Factor O in a positive direction and Factor Q_3 negatively. Three other primary factors with high weightings on second order Anxiety, C - Ego Strength, D - Excitability and G - Super Ego Strength had high loadings on the significant discriminant functions, with mean scores indicating lower Anxiety on the part of the Competitive groups.

The results compare favourably with those of Warburton and Kane (p.79) who found young athletes to be low on Anxiety. At the adult level Booth (p.84) with college competitive sportsmen, Kane (p.92) with professional footballers and Warburton and Kane (p. 99) with Olympic athletes had all reported low levels of Anxiety for their groups. However Kane and Callaghan (p.101) had found a tendency in the opposite direction with world class tennis players except for those at the very top.

There had been a suggestion based on the results of some of the studies reviewed in Chapter 2 that the Anxiety level of competitive swimmers was high as compared to the normally expected level. This was not found in this study.

Hendry (p.80) reported a high level of Anxiety with top level junior swimmers. This high Anxiety had also been found at an even higher level of performance - Olympic swimmers - by Warburton and Kane (p.104) but this was not replicated in Hardman's study (p.106). The suggestion must be that if such high levels of Anxiety found are the results of involvement in a competitive swimming environment they must occur at a later age and with association with higher levels of competition than those with which this study was concerned.

The findings from this study support Tutko's[1] statement that competitors learn how to cope with anxiety to which they are subjected in sporting contests.

(b) Competitive and Control Groups Initially Scoring High on Anxiety

Competitive Group

Those members of the Competitive group who had scored high on Anxiety at the commencement of the study showed an overall significant reduction in mean Anxiety level at the .01 level of significance. This matches in direction the trend revealed by the total competitive group which in its case was a non significant reduction.

Control Group

The reduction in mean Anxiety level by the Control group, high on Anxiety at 12 years, did not reach a significant level.

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[1] Thomas A.Tutko, "Some Clinical Aspects of Sports Psychology", Quest, 13 (January 1970), pp.12-17.

Competitive v Control Groups

The Competitive group classified as high scorers on Anxiety at the commencement of the study were already significantly (.01) lower than a comparable group of Controls. Significantly lower mean scores were retained by the Competitive group throughout the period of the study, .05 at 13 years and .01 at 14 years. These results were very similar to the comparisons made between the total groups.

The indication is that boys engaged in a competitive swimming environment and classified as high scorers on Anxiety are likely to reduce that level of Anxiety. The level of Anxiety of the Control group did not change significantly over the same period of time.

(c) Competitive and Control Groups Initially Scoring Low on Anxiety

Competitive Group

The Competitive group initially scoring low on Anxiety showed an overall significant (.01) mean gain between the ages of 12 and 14 years. The level at 14 years however remained appreciably below the norm mean score on the factor.

Control Group

The Control group, like the Competitive group significantly (.01) increased their mean Anxiety score from its initial low level, between 12 and 13 years and a .05 significant gain between 12 and 14. These results are very similar to those obtained in the analysis of the total Control group.

Competitive v Control Groups

The low scoring Competitive group were significantly lower on mean Anxiety score at the outset when the difference was at the .01 level. At 13 the difference was at the .05 level and by 14 years the difference was non significant. The indication then is of the groups drawing closer together as the study progressed. This was contrary to the trend shown by the total Competitive and Control groups where the gap widened during the course of the study. The fact that both initial low scoring groups (Competitive and Control) made significant gains in Anxiety suggests that as these boys grew older there was a developmental increase in Anxiety level unrelated to whether or not the boys were engaged in a competitive sport environment, with a tendency for them to more closely approximate to the mean score of their total group on this factor.

(d) Summary

The results from the foregoing analyses of Anxiety scores of Competitive and Control groups suggest that the level of Anxiety of the Competitive group is likely to be maintained at about the same level during the period of association with a competitive swimming environment whilst that of the non competitive group rises. The Competitive group with extreme scores at both ends of the Anxiety scale moved closer to the norm mean score on the factor as did the low scoring Control group, the high scoring Control group however did not show a significant reduction.

The findings from the total group comparison supported results obtained in the comparison of total personality profile analysed by multiple discriminant analysis.

(iii) Q_{III} Cortertia - Pathemia

(a) Competitive and Control Groups A, B and T

TABLE 2.6

F Ratio Levels of Significance for Cortertia Scores of Competitive and Control Groups at 12, 13 and 14 Years

	A	B	T
C12 v C13	+ NS	+.01	+.05
C13 v C14	+.01	+ NS	+.05
C12 v C14	+.01	+.01	+.01
N12 v N13	- NS	+ NS	+ NS
N13 v N14	+.01	+ NS	+.05
N12 v N14	+.05	+ NS	+.01
C12 v N12	+ NS	- NS	= NS
C13 v N13	+NS	+ NS	+ NS
C14 v N14	+NS	+ NS	+ NS

Competitive Groups

Increases in mean Cortertia scores were shown in all of the comparisons within the Competitive groups. Between the ages of 12 and 13 these mean increases achieved significant levels by the B group and T group with .01 and .05 values respectively. The same level was displayed by the T group between 13 and 14 years whilst the A group had a significant increase at the .01 level. Comparisons between 12 and 14 years yielded significant (.01) increases at 14 years by all three groups.

These results indicate that whilst a particular sub group may not increase its mean score in a one year span there is an overall increase in mean Cortertia level with particularly marked gains between the ages of 12 and 14 years.

Control Groups

With the exception of the A group between 12-13 when there was a small drop of 0.05 n sten in mean Cortertia scores all the comparisons for the Control groups, like those for the Competitive groups showed gains in mean Cortertia scores. These gains were non significant between ages 12-13 and the B group did not make any significant gain during the period of the study. Between the ages of 13 and 14 the A group displayed a .01 significant gain whilst for the T group the significance level was .05. Comparisons between 12 and 14 years revealed a significant increase by the A group and a significant (.01) increase by the T group.

The indication from these results is that like the Competitive groups the Control groups showed an overall increase in mean Cortertia level, which, except for the B group reached significant levels.

Competitive v Control Groups

Comparisons of the scores of the Competitive and Control groups showed that they were not significantly different when the study was commenced at 12 years of age. Similarly throughout the period of the study there were no significant differences recorded. The inference would be then that involvement in a competitive swimming environment has no influence on the Cortertia level displayed by boys as compared with groups of boys who do not participate in individual sporting competition.

Since Cortertia as a scored 2nd Order Factor has only comparatively recently been added to the H.S.P.Q. it was

not scored in the studies reviewed in Chapter 3 hence no comparisons with the present results are possible.

(b) Competitive and Control Groups Initially Scoring High on Cortertia

Competitive Group

The Competitive group classified as having initial high scores on Cortertia displayed an overall significant reduction at the .05 level between ages 12-13 and 13-14 years.

Control Group

Like the Competitive group the Control group also displayed significantly reduced mean Cortertia scores - .05 between 12-13 years and .01 between 12 and 14 years.

Competitive v Control Groups

There were no significant differences between the mean Cortertia scores of the Competitive and Control groups throughout the period of the study. In this respect these results matched those for the total groups. There were differences shown by these sub groups in that within group comparisons revealed decreased Cortertia level whilst the level for the total groups increased during the course of the study.

The inference from this comparison is similar to that for the comparison of total groups with respect to possible effects of a competitive environment on Cortertia level in that it must be deemed to have no effect.

(c) Competitive and Control Groups Initivally Scoring Low on Cortertia

Competitive Group

The Competitive group with low scores on Cortertia at 12 years showed significant (.01) gain in mean scores between 12-13 years and between 12-14 years.

Control Group

The Control group similarly displayed significant (.01) gains between the same ages.

Competitive v Control Groups

None of the differences between mean Cortertia scores reached significant levels. These results are very comparable to the results obtained by the total Competitive and Control groups with significant overall gains in mean Cortertia scores by both groups and no differences between the groups throughout the period of the study.

(d) Summary

The implication from the analysis of the results on Cortertia is that involvement in competitive swimming between the ages of 12 and 14 has no effect on the factor. Total Competitive and Control groups and sub groups having low initial scores both evidenced significant gains whilst having non significant differences between them, whilst the sub groups having high initial scores both fell in Cortertia level again with non significant differences between them. The competitive environment must be deemed therefore to have no effect on the activation level - cortical alertness and energy of the participants.

(iv) Q_{IV} Independence

(a) Competitive and Control Groups A, B and T

TABLE 2.7

F Ratio Levels of Significance for Independence Scores of Competitive and Control Groups at 12, 13 and 14 Years

	A	B	T
C12 v C13	+ NS	+ NS	+ NS
C13 v C14	-.01	- NS	-.01
C12 v C14	-.05	- NS	- NS
N12 v N13	+ NS	+.05	+.05
N13 v N14	+ NS	- NS	+ NS
N12 v N14	+ NS	+ NS	+.05
C12 v N12	- NS	-.05	-.05
C13 v N13	- NS	-.01	-.01
C14 v N14	-.01	-.01	-.01

Competitive Groups

There were small gains in mean Independence scores from the age of 12 to 13 years but none of these reached significant levels. Between the ages of 13 and 14 all three competitive groups showed reduced mean scores on Independence, which, in the case of the A and T groups were significant (.01). The overall comparison between 12 and 14 years displayed a reduction in mean scores which in the case of the A group was significant at the .05 level.

The implication from these results is that groups of boys competing in competitive swimming do not increase their scores on the Independence trait and there is a tendency towards a reduction in level of Independence.

Control Groups

In contrast to the results of the Independence trait

for the Competitive group comparisons of changes in mean scores of the Control groups showed that with one exception all means were higher at the older age of the comparisons, the gains being significant for both B and T groups between the ages of 12 and 13 and for the T group between the ages of 12 and 14 years.

The Control groups then who were not participating in a competitive sport routine were showing increased levels of Independence during the course of the study.

Competitive v Control Groups

At 12 years of age comparisons of the Competitive and Control groups on the Independence trait showed that the latter groups had higher mean scores and the B and T groups were significantly (.05) higher. For these groups the significant difference at 13 years had become one at the .01 level and by 14 years all three Control groups had significantly higher mean scores than their competitive counterparts at the .01 level.

As had been the case with the analysis of 2nd Order Exvia and Anxiety it was not possible to determine whether the lower mean Independence scores of the Competitive groups at the start of the study were a result of the groups already having been in a competitive environment or whether the demands of competitive swimming were more readily accepted by groups of boys who were less Independent. What is clear in this study is that the gap between the groups on the Independence trait grew wider during the overall period of the study, the Control groups gaining in

Independence whilst the Competitive groups at 14 were below the mean scores at 12 years.

The inference from these results must be that the competitive swimming environment does not foster increases in Independence trait of groups of participant boys. There is much routine training and swimmers tend to rely heavily on coaches and club officials for training schedules, competition entries, travel arrangements and the overall swimming programme. It may be that such heavy reliance on adult members of clubs is not encouraging development of the Independence trait and the overall development of these boys might be better served if they were given more opportunities to make decisions and judgements themselves.

Like the previous 2nd Order Factor, Cortertia, Q_{IV} Independence has only recently been added as a scored H.S.P.Q. factor and consequently cross reference with other studies of a similar nature have not been possible.

(b) Competitive and Control Groups Initially Scoring High on Independence

Competitive Group

The Competitive group with high initial Independence scores displayed an overall significant (.01) reduction in mean Independence scores. This was in the same direction but much more pronounced than the trend shown by the total Competitive group.

Control Group

The Control group showed no overall significant change in mean Independence score from the beginning to end of the study. The total Control group had significantly increased their mean during the same period. It seems reasonable to expect that those already high on the factor would be less likely to increase their score compared to those not so high.

Competitive v Control Groups

Comparison of the two groups evidencing high Independence at 12 years showed that the Competitive group had a significantly lower mean score. This difference was maintained at 13 years and increased to the .01 level at 14 years. This comparison matches that of the total groups.

The indication is then that competitive swimmers having a high level of Independence at 12 years are likely to show a lower level by 14 years of age.

(c) Competitive and Control Groups Initially Scoring Low on Independence

Competitive Group

The Competitive group initially scoring low on the Independence factor made an overall significant gain in mean score during the course of the study. This was the only comparison within the Competitive groups which displayed an increase in Independence.

Control Group

Like the Competitive group the Control group also showed

a gain in mean Independence scores from beginning to end of the study, the gain in this case being even more significant, at .01 level. The direction was the same as for the total Control group with more pronounced change.

Competitive v Control Groups

At 12 years the Competitive group were significantly (.01) lower on Independence than was the Control group. The difference remained at the same level at 14 years.

The indication is then that whilst low scorers on Independence in the Competitive group did improve their level during the course of the study the increase was less pronounced than that shown by the non-competitive group who were also classified as low scorers on the factor at the outset.

(d) Summary

From the analyses of the results on the Independence factor the indication is that the competitive environment detracts from the possibility of improving the level of Independence of the participants. A trend towards a reduction in mean score was evidenced by the total Competitive group whilst the total Control group made a significant gain. Competitors initially scoring high were significantly lower on the factor by the end of the study whilst the level of a comparable group of Controls remained unaltered. Competitors initially low on the factor did improve their position but not to the same extent as did a comparable group of Controls.

J.E.P.I. Variables Extraversion-Introversion and Neuroticism

Tables 5.28 and 5.32 in the Appendix list the mean and standard deviation raw scores for the Competitive and Control groups on the two personality variables measured by J.E.P.I. These tables also list the F ratio values for the Analyses of Variance for the comparisons at 12, 13 and 14 years within and between Competitive and Control groups. Summaries of the significance values of the Analyses of Variance of variables Extraversion-Introversion and Neuroticism are given in this chapter in tables 2.8 and 2.9 respectively.

Following each of the main analyses of the two J.E.P.I. factors, i.e. for those comparing Competitive and Control groups A, B and T, a two dimensional analyseis is made as is described in Chapter 3, for Competitive and Control groups who initially scored high or low on both factors. Tables 5.29 to 5.31 in the Appendix list the means, standard deviations, F ratios and significance levels for these sub group comparisons on Extraversion and Tables 5.33 to 5.35 in the Appendix give similar data on Neuroticism.

As indicated in Chapter 3 these groups comprised those subjects whose scores on both Extraversion and Neuroticism deviated more than one half of a standard deviation from their group mean. As a consequence numbers in the groups are small and higher F ratios are required for significance to be established. Numbers in the groups are as follows:

	Competitive Group	Control Group
High Extraversion/High Neuroticism	12	7
High Extraversion/Low Neuroticism	17	12
Low Extraversion/High Neuroticism	10	10

The remaining sub group Low Extraversion/Low Neuroticism was not included in the analysis because of the small numbers of subjects in the groups.

(i) Extraversion-Introversion

(a) Competitive and Control Groups A, B and T

TABLE 2.8

F Ratio Levels of Significance for J.E.P.I. Extraversion Scores of Competitive and Control Groups at 12, 13 and 14 Years

	A	B	T
C12 v C13	+ NS	+ NS	+.05
C13 v C14	+ NS	+ NS	+.05
C12 v C14	+.01	+.01	+.01
N12 v N13	+ NS	+ NS	+ NS
N13 v N14	+ NS	+ NS	+ NS
N12 v N14	+ NS	+ NS	+ NS
C12 v N12	+ NS	+ NS	+ NS
C13 v N13	+ NS	+.05	+.05
C14 v N14	+ NS	+.05	+.01

Competitive Group

All the comparisons of mean Extraversion scores within the Competitive groups revealed higher levels of Extraversion at the older ages. These differences between means were significant in the case of the T group both between the ages of 12-13 and 13-14 years. When comparisons were made

between ages 12-14 all three groups displayed significant (.01) gains. These results indicate a rising level of Extraversion over the period of the study by those groups of boys engaged in competitive swimming.

Control Group

Although the Control groups also showed increases in mean Extraversion scores during the period of the study these were much less pronounced, and the Analyses of Variance did not reveal any significant differences between mean scores. Reference to the norms for the J.E.P.I.[1] showed that the levels of Extraversion recorded by the Control groups were very comparable to the general population average for boys aged 12 and the increases recorded by the Control groups were also similar to those in the norm tables. These results therefore indicate that Extraversion scores of the Control group were in the direction and magnitude as would normally be expected for boys of these ages.

Competitive v Control Groups

Throughout the period of the study the Competitive groups recorded higher mean levels of Extraversion than did the Control groups. These differences however were non significant at 12 years at the commencement of the study. At the age of 13 years both the B and T Competitive groups

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[1] Sybil B.G.Eysenck, Manual of the Junior Eysenck Personality Inventory, London, University of London Press, 1965, p.6.

had significantly higher levels of Extraversion at the .05 level, which was maintained by the B group and increased to .01 by the T group at 14 years.

The indication here then is that groups of boys participating in a competitive swimming environment who at the outset were not significantly different in Extraversion levels to groups of boys who did not participate in individual competition became more outgoing, active, sociable and impulsive than the non competitive boys.

Although these results are by no means identical to the results of the H.S.P.Q. Exvia-Invia comparisons there is distinct similarity in overall impression. The differences in H.S.P.Q. as compared to J.E.P.I. results were that for the Competitive groups significant differences were found between 12-13 years, for the Control groups there were significant differences between ages 12 and 14 and in the comparisons of Competitive and Control groups there were significant differences already existing at 12 years. These apart the results are very comparable - overall increases in Extraversion by the Competitive groups throughout the study, non significant rises by the Control groups in the one year comparisons 12-13 and 13-14 and significantly higher level of Extraversion by the Competitive groups at 13 and 14 years. Further consideration of these two sets of results is given in section 4 of this chapter.

These results of J.E.P.I. Extraversion scores for the Competitive group are similar to those recorded by Whiting (p.79) for schoolboy competitive athletes in so far as his competitive group of athletes scored significantly higher on Extraversion measured by J.M.P.I. - a comparable inventory to J.E.P.I. - as compared with the norms for boys

in the same school. Hendry and Whiting (p.80) had reported conflicting results regarding the Extraversion levels of young swimmers. The evidence from this present study gives support to their earlier finding of a high level of Extraversion on the part of the swimmers.

(b) Competitive and Control Groups Initially Scoring High on Extraversion and High on Neuroticism[1]

Competitive Group

No significant changes in mean Extraversion scores were recorded. This contrasts with the total Competitive group where significant mean increases were recorded during the course of the study.

Control Group

Like the Competitive group there were no significant changes in mean Extraversion scores recorded by the Control group. These results were comparable to those of the total Control group.

(c) Competitive and Control Groups Initially Scoring High on Extraversion and Low on Neuroticism

Competitive Group

The Competitive group recorded an overall significant mean increase in Extraversion between 12 and 14 years. These results were similar to those recorded for the total Competitive group.

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[1] See p. 205, paragraph 3.

Control Group

With the Control group there was a fall in Extraversion level between ages 12-13 but a gain during the following year meant that for the overall comparison between 12-14 no significant change was recorded. This was comparable to the results for the total Control group and for the Initially High Extraversion/High Neuroticism Group.

(d) Competitive and Control Groups Initially Scoring Low on Extraversion and High on Neuroticism

Competitive Group

An increase in mean Extraversion scores was recorded but these did not reach a significant level. These results contrast with those of the total Competitive group where a significant mean gain was recorded.

Control Group

An overall significant mean increase in Extraversion scores between 12 and 14 years was recorded by the Control group. These results contrasted with those of the total Control group where no significant changes were recorded.

(e) Summary

From the foregoing comparison of the Extraversion scores of the Competitive and Control groups and from the two dimensional analysis of groups whose scores tended towards the extremes of the Extraversion and Neuroticism scales it would appear that taking the Competitive group as a whole

involvement in the competitive environment encourages the development of more extravert characteristics by the group. Those competitors who were already high on Extraversion at the commencement of the study only increased their scores on this factor if they were also at the lower end of the Neuroticism scale. Similarly those competitors who were initially high on the Neuroticism scale did not significantly increase their initially low Extraversion scores.

(ii) Neuroticism

(a) Competitive and Control Groups A, B and T

TABLE 2.9

F Ratio Levels of Significance for J.E.P.I. Neuroticism Scores of Competitive and Control Groups at 12,13 and 14 Years

	A	B	T
C12 v C13	+ NS	- NS	- NS
C13 v C14	- NS	- NS	- NS
C12 v C14	- NS	- NS	- NS
N12 v N13	+ NS	- NS	+ NS
N13 v N14	- NS	- NS	- NS
N12 v N14	+ NS	- NS	+ NS
C12 v N12	- NS	- NS	-.05
C13 v N13	-.05	- NS	-.05
C14 v N14	-.01	- NS	-.01

Competitive Groups

The level of the mean Neuroticism score remained largely unaltered during the course of the study. Eight of the nine comparisons within the Competitive groups in fact showed slight decreases in mean Neuroticism scores but none of these differences achieved significant levels. The implication from these results suggest that association

with a competitive swimming environment over the period of the study has little effect on the Neuroticism level of the participant groups.

Control Groups

As was the case with the Competitive groups there were no significant differences between mean Neuroticism scores of the Control groups. The scores remained largely the same during the period of the study although there was a trend for those of the A and T group to increase whilst the reverse was true of the B group. In the norm for the test Sybil Eysenck[1] had reported no change in Neuroticism scores for boys so the obtained results were as one might have expected except that they were higher at 12 years than the published norms and remained higher throughout the study.

Competitive v Control Groups

There were no significant differences between Competitive and Control Groups A or B at 12 years but the difference between the T groups was significant at the .05 level. The B group comparison remained non significant throughout the study whilst the A and T groups had significantly different mean scores at the .05 level at 13 years and at the .01 level at 14 years. In all cases the Competitive group had the lower mean scores and their scores approximated to the published norms for the scale.

From these results it may be deduced that at the

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[1] Sybil B.G.Eysenck, Loc.cit.

commencement of the study there was evidence that the competitive group as a whole had a lower mean Neuroticism score and generally the gap between the groups widened during the course of the study. Although these results were not so pronounced as had been recorded earlier in this chapter in the analysis of H.S.P.Q. Anxiety the overall impression is comparable in that it would appear, certainly in this study, that groups of boys engaged in a competitive swimming programme are not affected in any detrimental way in terms of Neuroticism level. The evidence here would suggest the reverse in fact, that they become less anxious, restless, moody or rigid - the characteristics generally associated with Neuroticism, than their non-competitive controls. The relationship between the obtained H.S.P.Q. Anxiety and J.E.P.I. Neuroticism results is discussed further in section 4 of this chapter. These results again tend to refute the suggestion posed in chapter 2 that constant association with the pressures of competition might have the effect of heightening characteristics such as anxiety, worry or moodiness.

The mean Neuroticism score of the Competitive group at 14 years was close to the published norm for the score in the test manual[1] and in this respect matched the second finding of Hendry and Whiting (p.80) of young competitive swimmers having a level of Neuroticism close to published norms.

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[1] Ibid., p.7.

(b) Competitive and Control Groups Initially Scoring High on Neuroticism and High on Extraversion

Competitive Group

The Competitive group showed an overall significant reduction in mean Neuroticism score between 12 and 14 years. The total Competitive group had displayed a trend towards reduced Neuroticism but this had not reached a significant level.

Control Group

No significant differences were recorded by the Control group. These results matched those of the total Control group on Neuoticism.

(c) Competitive and Control Groups Initially Scoring High on Neuroticism and Low on Extraversion

Competitive Group

During the first year of the study a significant decrease in mean Neuroticism score was recorded, however, a rise in the score during the following year meant that overall between 12-14 years the decrease in mean Neuroticism was non significant. This result between 12 and 14 years matched that of the total Competitive group.

Control Group

No significant differences were recorded by the Control group, matching the results of the total Control group.

(d) Competitive and Control Groups Initially Scoring Low on Neuroticism and High on Extraversion

Competitive Group

There were no significant differences between mean Neuroticism scores of the Competitive group although an overall gain between 12 and 14 years almost reached the .05 level.

Control Group

The Control group displayed an overall significant gain in Neuroticism between 12 and 14 years.

(e) Summary

From the foregoing analyses of the comparison of total Competitive and Control groups on Neuroticism and from the two dimensional analysis of groups tending to the extremes of both Neuroticism and Extraversion scales the evidence seems to suggest that groups of boys participating in competitive swimming are not adversely affected in terms of Neuroticism level through such participation. Indeed there was a widening of the gap between Competitive and Control groups on Neuroticism during the course of the study with the former having the lower mean level. The two dimensional analysis revealed that those boys high on Extraversion were more likely to show reduced Neuroticism scores from an initial high level and less likely to show increased Neuroticism scores from an initial low level if they were members of the Competitive group. In the analysis

of the group initially low on Extraversion no significant change on Neuroticism from an initial high level was recorded by either Competitive or Control groups.

Physicial Strength Development - Left Grip Test

Mean and Standard Deviation scores of the Competitive and Control groups on the left-grip test are listed in Table 5.36. The scores are recorded in pounds since the tests were conducted with a manuometer recording in pounds during the years 1967-70, decimilisation taking place in Britain in 1971. The same table also lists the F ratio values for the Analyses of Variance for comparisons at 12, 13 and 14 years within and between Competitive and Control groups. A summary of the significance values of the obtained F ratios are given below in Table 2.10

TABLE 2.10

F Ratio Levels of Significance for Left Grip Test Scores of Competitive and Control Groups at 12,13 and 14 Years

	A	B	T
C12 v C13	+.01	+.01	+.01
C13 v C14	+.01	+.01	+.01
C12 v C14	+.01	+.01	+.01
N12 v N13	+.01	+.01	+.01
N13 v N14	+.01	+.01	+.01
N12 v N14	+.01	+.01	+.01
C12 v N12	+ NS	+.05	+.05
C13 v N13	+ NS	+.05	+ NS
C14 v N14	+.05	+.05	+.01

Competitive Group

Significant (.01) gains in left grip test scores were made by all three groups at one year intervals 12-13 and 13-14 and during the overall period of the study. These results were what would normally be expected for boys of this age range.

Control Group

Results comparable to those of the Competitive groups were obtained in the analysis of left grip scores of the Control groups. All the comparisons made revealed significant (.01) gains.

Competitive v Control Groups

The A groups were not significantly different at 12 or 13 years but by 14 years the mean score of the Competitive group was significantly higher at the .05 level. The B and T groups were significantly different at 12 years with the Competitive group having the higher mean score. This gap was maintained at the same level of significance throughout the period of the study by the B group whilst the level of significance for the T group had increased to the .01 level by the age of 14.

The significant differences found in mean scores by two of the groups at 12 years may seem surprising in view of the fact that the matched pairs within the groups were equated at 12 years on a four item strength battery of which left grip was one item and with which it has a high correlation. However as was stated in Chapter 3 this

equation was within a 10% difference and reference to Table 5.36 shows that this was the approximate difference between the mean left grip scores at this age.

The deduction from these results is that both Competitive and Control groups showed the marked gains in strength that one would expect from boys at these ages and differences found remained throughout the study within the initial 10% difference in strength levels that the group members had been matched. The fact that the Competitive groups did not show much greater gain in strength than the Control groups may also seem somewhat surprising in view of the fact that they undoubtedly, through their training for competitive swimming, take part in a great deal of physical activity. However this is understandable since the type of training largely pursued by competitive swimmers of this age is aimed at improvement of muscular and cardio-respiratory endurance and with a few exceptions it is usually older swimmers who include in their training programmes routines such as weight training which are specifically aimed at improving strength levels.

The results obtained from this study on the left grip test displayed a marked similarity to those of boys of comparable age in the Medford Growth Study reported by Bailey[1]. The mean scores at 12-13 and 14 years in that study were 55.5, 65.0 and 77.5 lbs. Mean scores from this present study proved to be very similar.

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[1]Don Charles Bailey, "Longitudinal Analysis of Strength and Motor Development of Boys Ages Twelve Through Seventeen Years", Microcarded Ed.D. Thesis, University of Oregon, 1968, p.100.

2. Successful and Unsuccessful Competitive Groups

H.S.P.Q. Total Personality Profile and Primary Factors

Means and standard deviations of the fourteen primary personality factors measured by H.S.P.Q. for the Successful Competitive group are presented in Table 6.1 in the Appendix. Table 6.2 lists comparable data for the Unsuccessful competitive group. Tables 6.3 to 6.5 in the Appendix detail the obtained results from the Multiple Discriminant Analyses by which comparison of the total personality profiles were made within and between Successful and Unsuccessful Competitive groups. These tables are presented in a similar manner to those relating to the total Competitive groups, as is the summary table 3.1 in this chapter. In the summary table the signs + and - refer to higher or lower mean scores at the older age level or in the case of the between group comparisons to higher or lower mean scores by the Successful group.

TABLE 3.1

H.S.P.Q. Total Personality Profile of Successful and Unsuccessful Competitive Groups: Summary of Multiple Discriminant Analyses

	Successful			Unsuccessful			Successful v Unsuccessful		
	12v13	13v14	12v14	12v13	13v14	12v14	12	13	14
Eigenvalue	NS	NS	.05	NS	NS	.05	NS	.05	.05
Wilks Lambda	NS	NS	.05	NS	NS	.05	NS	.05	.05
Main contribution to significant function									
A									+
B			+					-	
C								-	-
D			-			-		+	+
E			+					-	
F									
G			+					+	+
H						+		-	-
I								-	
J						-		-	+
O						-		-	+
Q_2									
Q_3									
Q_4									

Successful Competitive Group

Comparisons of total personality profiles at one year intervals revealed no significant changes. However the comparison made over the total period of the study between profiles at 12 and 14 years were significantly different, the obtained eigenvalues and Wilks Lambda being at the .05

level. Reference to Table 6.3 shows that four factors had similar weightings to the discriminant function, these were Factor C - Ego Strength, J - Coasthemia, O - Guilt Proneness and Q_4 - Ergic Tension with the indication that at fourteen this group was more stable, more individualistic, less apprehensive and less tense than had been the case at 12 years. However the factors with highest contribution to the discriminant function were those indicated in Table 3.1: B - Intelligence, D - Excitability, E - Dominance and G - Super Ego strength with the indication that by the age of 14 years the Successful Competitive group were brighter, less excitable and more dominant and persistent than they had been at 12 years.

These results were very comparable with those obtained in the total Competitive group analysis except for Factor J which did not have a high weighting in that comparison.

The implication then is that over the period of this study the total personality profile of the Successful Competitive group did change and the primary factors contributing most to the discriminant function were largely the same, with the same direction of change, (with the exception of Factor J - Coasthemia as noted above) as had been found for the total Competitive group.

Unsuccessful Competitive Group

Like the Successful Competitive group the comparison of total personality profiles of the Unsuccessful Competitive group at one year intervals did not reveal significant changes although that between 13 and 14 years was close to

the .05 significant level which had been recorded at those ages by the total Competitive group.

Again like the Successful group the comparison between 12 and 14 years was significantly different with the obtained eigenvalue and Wilks Lambda reaching the .05 level. Reference to Table 6.4 in the Appendix shows that four primary factors had similar contributions to the discriminant function: B - Intelligence, E - Dominance, G - Super Ego Strength and Q_3 - Self Sentiment Integration, indicating that the Unsuccessful group were brighter, more dominant and persistent but less controlled at 14 years. The primary factors with the highest contribution to the discriminant function were D - Excitability, H - Parmia, J - Coasthemia and O - Guilt Proneness, indicating that the group was less excitable, more socially bold, more zestful and liking group action and less apprehensive at 14 years than had been the case at the outset of the study.

These results largely showed changes on primary factors in the same direction as had been the case with the Successful group, the exceptions being that Factor J was in the opposite direction (the Successful group becoming more individualistic) and Factors H and Q_3 did not figure high on the weightings to the discriminant function of the Successful groups profiles.

The changes in primary factors were also of a similar nature to those evidenced by the total Competitive group the main difference being higher loadings on H - Parmia and J - Coasthemia to the discriminant function relating to the Unsuccessful group profile.

Successful v Unsuccessful Competitive Groups

At the outset of the study at 12 years the group of boys who were to prove successful in competition during the course of the study did not differ in total personality profile from the group of boys who were to prove the least successful of the Competitive group throughout the period of the study. The multiple discriminant analysis of their total personality profiles revealed no significant function which would discriminate between the two groups. In this respect the result was comparable to that of the total Competitive and Control groups at 12 years. It also indicated that at this age it is not possible to forecast competitive success on personality grounds.

As indicated in the section above the profiles of both groups did change during the study. Whilst there were several similar changes recorded by both groups, certain differences between the groups did occur. At the age of 13 and again at 14 multiple discriminant analysis revealed a significant function.

Reference to Table 6.5 shows the primary factors with high contributions to the discriminant functions whilst Table 3.1 summarises these, showing the highest contributors. It would appear that certain of the differences displayed at 13 were of a transient nature since they were not replicated at 14 years. These were B - Intelligence, E - Dominance and I - Harria indicating that at 13 the Successful group were less bright, less dominant and more tough minded than the Unsuccessful group. At this stage there was a tendency towards being less Individualistic (J) on the part

of the Successful group this however was reversed by the end of the study at fourteen as was the position on Factor O - Guilt Proneness where the Successful group scored higher than the Unsuccessful group at 14.

Factors with substantial contributions to the discriminant function which recurred in both comparisons at 13 and at 14 were C - Ego Strength, D - Excitability, H - Parmia and G - Super Ego Strength which indicated that compared to the Unsuccessful group the Successful group were less emotionally stable, more excitable and more threat sensitive yet were more conscientious. With a high contribution by Factor A - Affectothymia to the discriminant function at 14 the Successful Competitive group could also be characterised as being more outgoing at this age.

At first sight the impression may be gained that the Unsuccessful group were developing certain more desirable personality characteristics than were the Successful group. This however was not really the case as careful scrutiny of Tables 6.1 to 6.5 and of Table 5.6 revealed. In fact of course the comparisons made were relative to each other and on C - Ego Strength, D - Excitability, H - Parmia, O - Guilt Proneness, the trend of both groups was in the more desirable direction. What had occurred was that the scores for the Unsuccessful group had changed to a greater degree during the course of the study. Relative to the mean scores of the total Control group both Successful and Unsuccessful Competitive groups revealed trends on Factors C, D, H and O which would normally be regarded as being more desirable.

These results therefore indicate that like the total Competitive groups, sub groups of Successful and Unsuccessful Competitors do show changes in personality profile between the ages of 12 and 14. Changes in primary factor scores revealed increased intelligence, dominance and persistence with decreased excitability. Differences between the degree to which the changes took place were noted in comparisons between the groups. There was a tendency towards a greater individualistic characteristic on the part of the Successful group by the age of 14. The Unsuccessful group at 14 had higher stability and less excitability and guilt proneness but displayed less persistence than the Successful group. The direction of change on these primary factors was the same for both groups. The personality profiles of both groups had not been significantly different at the outset of the study hence no support could be given to the possibility of forecasting competitive success on personality grounds.

The finding that primary factor O had high weighting on the significant function which distinguished the two groups at both 13 and 14 years, with the Unsuccessful group having the lower mean score in both cases, and with a decreasing level from 12 - 14 years, refutes the suggestion put forward in Chapter 2 regarding guilt proneness and lack of competitive success (p.52). Certainly in this study with boys aged 12-14 this suggested relationship was not substantiated. As was outlined in Chapter 2 evidence has been put forward of guilt proneness in certain cases being a contributory factor to lack of competitive success. It would seem however that if this relationship does exist it must develop at a later age than the age range considered in this present study.

H.S.P.Q. 2nd Order Factors

Tables 6.6 - 6.9 in the Appendix list the mean and standard deviation n sten scores for the Successful and Unsuccessful Competitive groups on four second order factors. Also presented in these tables are the F ratio values for the Analyses of Variance for the comparisons within and between the two groups. A summary of the obtained F ratios on the factors is given in Table 3.2 in this chapter. The signs + and - indicate higher or lower mean scores at the older age in the within group comparisons and for the Successful group in the between group comparisons.

TABLE 3.2

F Ratio Levels of Significance for Exvia, Anxiety, Cortertia and Independence Scores of Successful and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Exvia	Anxiety	Cortertia	Independence
SC12 v SC13	+ NS	- NS	+ NS	- NS
SC13 v SC14	+.05	- NS	+ NS	- NS
SC12 v SC14	+.01	- NS	+ NS	- NS
UC12 v UC13	+.01	- NS	+.01	+ NS
UC13 v UC14	+ NS	- NS	+ NS	-.01
UC12 v UC14	+.01	- NS	+.01	-.05
SC12 v UC12	- NS	+ NS	- NS	+ NS
SC13 v UC13	- NS	+ NS	- NS	- NS
SC14 v UC14	- NS	+ NS	- NS	+ NS

(i) Q_I Exvia-Invia

Successful Competitive Group

A continuous rise in mean Exvia level was recorded by the Successful Competitive group during the period of the study. The difference between 12-13 was non significant

between 13-14 the difference was significant at the .05 level and the overall mean increase was significant at the .01 level. The analysis of the total Competitive group had also revealed an overall mean gain on Exvia at this level.

Unsuccessful Competitive Group

Like the Successful group and the total Competitive group the Unsuccessful group also displayed an overall significant (.01) mean gain in Exvia. In their case the mean increase between 12-13 was also significant at the .01 level but that between 13-14 did not reach significance.

Successful v Unsuccessful Competitive Groups

No significant differences between mean Exvia scores of the two groups were recorded at any age during the study.

It would appear then that whether or not groups of boys are successful in competitive swimming they are likely to become more socially outgoing.

These results support the results of the Multiple Discriminant Analyses of the two groups. There, Factors E - Dominance and H - Parmia - both loading high on 2nd order Exvia - were found to be major contributors in the within group comparisons. Lack of significant differences in mean Exvia scores between the groups might have been forecast from the results of the between group Multiple Discriminant Analyses since factors such as A - Affectothymia, H - Parmia and O - Guilt Proneness with high weightings on Exvia were contributors to the significant functions obtained but in contrary direction, thus having the effect of cancelling each

other out as far as differences in Exvia are concerned. These particular sets of results give weight to the contention of Cattell and Cattell[1] that it is necessary to score primary as well as secondary factors for a true picture of personality.

(ii) Q_{II} Anxiety

Successful Competitive Group

Like the total Competitive group the trend of the mean Anxiety scores was downward but none of the differences between means were significant.

Unsuccessful Competitive Group

Comparable results were obtained with the Unsuccessful Competitive group with no significant differences between mean scores.

Successful v Unsuccessful Competitive Groups

The mean score of the Successful group on Anxiety was slightly higher than that of the Unsuccessful group throughout the study but none of the differences were significant.

These results indicate that for boys of this age there is no increase in level of Anxiety whether they were members of the Successful group or of the Unsuccessful group. In Chapter 2 it had been suggested that repeated association with the pressures involved in a competitive environment

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[1] Cattell and Cattell, Op.cit., pp.37-40.

might have either adverse or beneficial effects on Anxiety level. Furthermore it could be hypothesised that those who were successful would be competing in more finals and in higher levels of competition - national or even international in some cases and would therefore be subject to increased pressure. Similarly since they were successful their position as such would be under constant threat. The results from this study indicate no detrimental effects on the Successful group in terms of increased Anxiety nor incidentally on the Unsuccessful group as a corollary to their lack of success.

(iii) Q_{III} Cortertia - Pathemia

Successful Competitive Group

Although the trend in mean Cortertia scores was in an upward direction during the course of the study none of the differences between means for this group reached significant levels. In the comparison of the total Competitive group on this factor significant mean gains had been shown.

Unsuccessful Competitive Group

There was a significant mean gain in Cortertia level for this group between the ages of 12 and 13 years, at the .01 level, with a similar result in the overall comparison between 12 and 14 years. These results were very comparable to those of the total Competitive group.

Successful v Unsuccessful Competitive Groups

Although the Unsuccessful group had shown a significant

gain during the course of the study none of the between group comparisons reached significant levels. The comparison of total Competitive and Control groups had similarly shown no significant differences between the groups indicating that the competitive environment had no effect on activation level (cortical alertness). Similarly the results of the Successful and Unsuccessful groups seem to indicate the same conclusion although there is evidence of a greater increase on the part of the Unsuccessful group, the group which is probably less intensely involved in the competitive environment.

(iv) Q_{IV} Independence

Successful Competitive Group

There was a downward trend in mean Independence score during the study but none of the differences between means reached significant levels. The overall non significant reduction in scores from 12-14 matched the results of the total Competitive group.

Unsuccessful Competitive Group

After a small non significant rise in mean Independence score between 12 and 13 years there was a decrease in Independence level from 13-14 years significant at the .01 level with an overall mean decrease between 12-14 years which was significant at the .05 level. The change in level of Independence displayed by this group was in the same direction as both the Successful and total Competitive groups but was more pronounced.

Successful v Unsuccessful Competitive Groups

At the commencement of the study at 12 years the mean Independence level of the two groups was not significantly different. The differences remained non significant throughout the study.

These results show the same downward trend as had been evidenced by the total Competitive group with the most pronounced decreases in mean score shown by the group composed of boys who were least successful during the course of the study.

(v) Summary

The results of the comparisons of H.S.P.Q. 2nd Order factors show that it is not possible to forecast on personality grounds at 12 years of age whether a competitor is likely to be successful since at this age, there were no significant differences between mean scores of groups who were composed of competitors who subsequently were successful and unsuccessful. This replicates the conclusion arrived at in the analysis of total personality profiles by multiple discriminant analysis.

Similarly it would appear that there would be few evident differences displayed in the development of second order personality factors by competitors in the two groups particularly in respect to Exvia and Anxiety. On the two other factors the trends are comparable for both groups with some evidence of slightly greater gain in Cortertia level and fall in Independence level by the Unsuccessful

group. In none of the between group comparisons did differences between mean scores reach significant levels. Since the comparison of total Competitive and Control groups had revealed significant differences on certain aspects of personality during the course of the study and differences between Successful and Unsuccessful Competitive groups are basically non significant it follows that involvement in the competitive environment is of greater consequence in effect on personality development than is membership of a successful or unsuccessful group.

Although a direct comparison with the results of studies by Ogilvie and Tutko (p.105) and by Parsons (p.107) clearly cannot be made with the groups involved in this study it is perhaps worth recalling that with very high level performers no significant differences were found on 16PF primary and secondary factors between groups who were most and least successful. Again with high level performers Rushall (p.108) had found that the more successful were high on E - Dominance a highly weighted primary factor to second order Extraversion and low on I - Harria, and Hardman (p.106) had found a group of Olympic Swimmers to be significantly higher on Extraversion than a group of club swimmers. Rushall (p.81) however with a group closer to the Successful group of this study had found that they approximated to the norm on 16PF and Newman (p. 81) had not been able to differentiate between faster and slower High School swimmers on personality traits in his study. Reference has already been made to the different findings on Anxiety of the present study as

compared to those reported by Hendry (p.80).

J.E.P.I. Variables Extraversion-Introversion and Neuroticism

Tables 6.10 and 6.11 in the Appendix list the mean and standard deviation raw scores for the Successful and Unsuccessful Competitive groups on the two personality variables measured by J.E.P.I. These tables also list the F ratio values for the Analyses of Variance for the comparisons at 12, 13 and 14 years within and between the groups. Summaries of the significant values of the Analyses of Variance of variables Extraversion-Introversion and Neuroticism are presented in this chapter in Table 3.3. Interpretation of this table follows the procedure previously described for H.S.P.Q. 2nd order factors.

TABLE 3.3

F Ratio Levels of Significance for J.E.P.I. Extraversion and Neuroticism Scores of Successful and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Extraversion	Neuroticism
SC12 v SC13	+ NS	+ NS
SC13 v SC14	- NS	- NS
SC12 v SC14	+ NS	- NS
UC12 v UC13	+.05	-.05
UC13 v UC14	+ NS	- NS
UC12 v UC14	+.01	-.05
SC12 v UC12	- NS	+ NS
SC13 v UC13	- NS	+ NS
SC14 v UC14	- NS	+ NS

(i) Extraversion-Introversion

Successful Competitive Group

No significant differences in mean Extraversion scores were recorded by the Successful Competitive group during the course of the study. This contrasted with the result for the total Competitive group where significant increases were recorded.

Unsuccessful Competitive Group

In contrast to the Successful group but in accordance with the finding for the total Competitive group there was an overall significant (.01) mean gain in Extraversion.

Successful v Unsuccessful Competitive Groups

The difference between mean Extraversion scores was non significant at 12 years and remained so throughout the study.

Like the results obtained with H.S.P.Q. Exvia these results suggest that involvement in the competitive environment is a more potent factor in the development of more outgoing personality characterstics than is membership of a successful group. If anything the successful competitors are less likely to display increasing levels of Extraversion - as measured by J.E.P.I. - than those competitors classified as least successful. There is a certain amount of difference in the J.E.P.I. Extraversion results compared to those of H.S.P.Q. Exvia in that in the latter both groups significantly increased their scores during the period of the study.

(ii) Neuroticism

Successful Competitive Group

Like the total Competitive group no significant differences between mean Neuroticism scores were recorded by the Successful Competitive group.

Unsuccessful Competitive Group

The mean Neuroticism score for this group was significantly lower at 13 and 14 years compared with the initial level at 12 years.

Successful v Unsuccessful Competitive Groups

None of the differences between means of the two groups reached significant levels. The overall trend of the mean Neuroticism scores was in a downward direction for both groups with a more pronounced reduction displayed by the Unsuccessful group. Since the differences between the scores of the two groups were non significant and since it was found in the comparison between total Competitive v total Control groups that the former were lower on this scale it follows that involvement in the competitive environment whether as a successful competitor or not is likely to result in a reducing level on the Neuroticism scale, this reduction being particularly marked in the case of the Unsuccessful group - the group who do not reach major finals and whose lack of success in these terms means that they are not defending an attained position of success and consequently are less subject to threat in this respect.

Certainly the results in this study both with J.E.P.I.

Neuroticism scores and with H.S.P.Q. Anxiety scores refutes any argument that competitive swimmers as a group at this age and level of competition are likely to become more moody anxious or prone to worry as a result of their association with anxiety provoking situations of the competitive environment.

Physical Strength Development - Left Grip Test

Mean and Standard Deviation scores of the Successful and Unsuccessful Competitive groups on the left grip test are listed in Table 6.12. Also presented in this table are the F ratio values for the Analyses of Variance for comparisons at 12, 13 and 14 years within and between the two groups. A summary of the significance values of the obtained F ratios are given below in Table 3.4.

TABLE 3.4

F Ratio Levels of Significance for Left Grip Test Scores of Successful Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

SC12 v SC13	+.01	UC12 v UC13	+.01	SC12 v UC12	+.05
SC13 v SC14	+.01	UC13 v UC14	+.01	SC13 v UC13	+ NS
SC12 v SC14	+.01	UC12 v UC14	+.01	SC14 v UC14	+.05

Successful Competitive Group

Like the total Competitive Group significant (.01) mean increases on mean left grip strength scores were recorded for all the comparisons during the study.

Unsuccessful Competitive Group

This group also recorded comparable gains in strength to

those of the Successful group, all differences between means being significant (.01).

Successful v Unsuccessful Competitive Groups

Whilst both groups had shown comparable gains in strength throughout the study there already existed at 12 years a significant difference between the mean scores of the two groups with the group composed of swimmers who were subsequently to become successful having the higher mean score. At 13 years this difference was non significant but by 14 years had again reached a significant .05 level.

The implication from these results is that a boy is more likely to be successful in competitive swimming at these ages if he has a high level of strength. Other factors such as skill, training, are of course important, but these results certainly suggest that high level of strength relative to other competitors is a contributory factor to success. There is a distinct possibility that as Clarke and Harrison found (p.135), those boys who are physiologically early maturers and who have the associated growth spurt in strength earlier than their peers of the same chronological age are those who will display this higher level of strength with consequent advantages in competitions at this age range.

3. Competitive Drop Out Group

The group of boys who dropped out of competition were compared in turn with the Successful and Unsuccessful groups at 12 years. The analyses of the two latter groups had revealed only one significant difference between the two

groups and that was on the strength test, nevertheless separate analyses were made in the comparisons with the Drop Out group.

(i) H.S.P.Q. Total Personality Profile and Primary Factors

Table 7.1 in the Appendix lists the mean and standard deviation scores of the fourteen primary factors measured by H.S.P.Q. for the Drop Out group at 12 years of age. Table 7.2 in the Appendix details the obtained results from the Multiple Discriminant Analyses by which comparisons of total personality profiles were made between the Drop Out group and the Successful and Unsuccessful Competitive groups.

The results from these analyses revealed no significant function which discriminated the groups at 12 years indicating that the total personality profile, as measured by H.S.P.Q., of the Drop Out group did not differ from that displayed by either Successful Competitive or Unsuccessful Competitive groups at 12 years.

(ii) H.S.P.Q. 2nd Order Factors

Tables 7.3 to 7.10 in the Appendix detail mean and standard deviations of 2nd Order Factors Exvia, Anxiety, Cortertia and Independence, together with Analysis of Variance F ratio values for the comparisons made on these factors between Drop Out and Successful Competitive and Unsuccessful Competitive groups at 12 years of age.

No significant differences between means were recorded on any of the comparisons made thus indicating that, like the total personality profile, differences could not be discerned between the groups on any of these personality factors.

(iii) J.E.P.I. Variables Extraversion-Introversion and Neuroticism

Tables 7.11 to 7.14 in the Appendix detail means and standard deviations of Extraversion and of Neuroticism together with Analysis of Variance F ratio values for the comparisons made on these factors between Drop Out and Successful Competitive and Unsuccessful Competitive groups at 12 years of age.

Like the analyses of the H.S.P.Q. Exvia and Anxiety results no significant differences were found between the means of Extraversion and Neuroticism for any of the comparisons made. These results similarly indicated that at 12 years the boys who subsequently dropped out of competition did not differ on the higher order personality variables measured by J.E.P.I.

Summary

The results from the multivariate analysis of total personality profile and from the univariate analyses of higher order factors both as measured by H.S.P.Q. and J.E.P.I. did not reveal any significant differences between the Drop Out group and either Successful or Unsuccessful Competitive groups. The implication is that it is not possible to differentiate on personality aspects as used in this study, those boys at 12 years of age who will not remain in competition from those boys who will remain in competition and become successful and from those boys who will remain in competition yet not achieve success.

Physical Strength Development - Left Grip Test

Mean and standard deviations of the left grip test together with Analysis of Variance F ratio values for the comparison between Drop Out and Successful Competitive and Unsuccessful Competitive groups at 12 years of age are presented in Tables 7.15 to 7.16 in the Appendix.

With the mean score of the Drop Out group lying approximately half way between those of the two competitive groups neither of the two F ratios were significant, indicating that at 12 years of age the Drop Out group was not significantly different on strength as measured by the left grip test from either the Successful or Unsuccessful Competitive groups. Lack of strength was not therefore a factor which could be considered in determining the reason for non continuance in competition.

4. Comparison of Results from H.S.P.Q. (Cattell) and J.E.P.I. (Eysenck)

In Chapter 3 a comparison was made of the approach to personality measurement of Cattell and of Eysenck. In view of the discussion there and since inventories from both sources were used in this study, both of which included measures of the better known higher order personality factors (Exvia and Anxiety in Cattell's terms, Extraversion and Neuroticism in Eysenckian terminology) it was decided that it would be useful to make a comparison of the respective results obtained on these variables in this study.

Product moment correlations were calculated between Cattell Exvia and Eysenck Extraversion and between Cattell Anxiety and Eysenck Neuroticism scores of the total Competitive and Control groups, separately, at each age tested, 12, 13 and 14 years. The results of these calculations are presented below in Table 4.1.

TABLE 4.1

Product Moment Correlations between Cattell Exvia and Eysenck Extraversion and between Cattell Anxiety and Eysenck Neuroticism for Total Competitive and Control Groups at 12, 13 and 14 Years

Group	Exvia and Extraversion		Anxiety and Neuroticism	
	r	p	r	p
C12	0.128	N.S.	0.277	.01
C13	0.360	.01	0.405	.01
C14	0.295	.01	0.380	.01
N12	0.176	N.S.	0.262	.01
N13	0.198	.05	0.410	.01
N14	0.318	.01	0.577	.01

With 104 df a correlation of 0.191 was required for significance at the .05 level and 0.249 for significance at the .01 level.

All the correlations were positive and all those between Anxiety and Neuroticism were significant at the .01 level. Three of the correlations between Exvia and Extraversion were significant at the .01 level, one at .05 and two correlations did not reach significance. In view of the discussion in Chapter 3 the finding of higher correlations for Anxiety-Neuroticism than for Exvia-Extraversion was somewhat surprising.

During the analyses discussed earlier in this present chapter there had been a generally good measure of agreement in the group trends found on Exvia and Extraversion and on Anxiety and Neuroticism. A summary of these trends for the total Competitive and Control groups is presented below in Table 4.2

TABLE 4.2

Summary of Trends on Exvia and Extraversion and on Anxiety and Neuroticism for Total Competitive and Control Groups at 12, 13 and 14 Years

	Exvia	Extraversion	Anxiety	Neuroticism
C12 v C13	+.01	+.05	- NS	- NS
C13 v C14	+.01	+.05	- NS	- NS
C12 v C14	+.01	+.01	- NS	- NS
N12 v N13	+ NS	+ NS	+.05	+ NS
N13 v N14	+ NS	+ NS	+ NS	- NS
N12 v N14	+.01	+ NS	+.05	+ NS
C12 v N12	+.05	+ NS	-.01	-.05
C13 v N13	+.01	+.05	-.01	-.05
C14 v N14	+.01	+.01	-.01	-.01

Perusal of Table 4.2 reveals a marked similarity of pattern in the two comparisons. In only one case is there a difference in trend (mean scores moving in the same direction). This was for the Control group between 13 and 14. The difference in fact was very small a rise of .07 n sten score on Anxiety as opposed to a fall of 0.21 in Neuroticism raw score.

The second feature revealed in Table 4.2 is that the Cattell scales in several cases display significant differences whilst the Eysenckian scales do not, or significance at .01 as compared with .05 on the Eysenck variables. This may well

be due to the nature of the respective inventories with that of Cattell having many more questions related to the higher order factors being compared here than is the case with the Eysenck inventory. Similarly the scoring on the Cattell scale is more complex. An argument could be put forward on these lines that the Cattell inventory is more discriminating. If differences between groups do exist on a variable then higher levels of significance might be expected when this inventory is used than would be the case when using a shorter form of test.

A more likely reason for the obtained correlations not being higher than they are is that whilst the variables measured by the two tests are similar they are not identical. This may be particularly so in the case of the Exvia-Extraversion variables. Eysenck and Eysenck[1] have commented on the differences between the American conception of extraversion with its emphasis on sociability and ease in interpersonal relations and the European conception of extraversion with its emphasis on impulsiveness and weak super ego controls and have pointed out differences which could occur if questionnaires contained more sociability than impulsiveness questions or vice versa. (A check on J.E.P.I. revealed approximately a 42% loading on sociability items on the Extraversion scale.) Cattell and Cattell[2] in fact state that the nature of their Exvia-Invia does differ from the Eysenck concept of Extraversion

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[1] H.J.Eysenck and S.B.Eysenck, Personality Structure and Measurement, London, Routledge and Kegan Paul, 1969, p.142-148.

[2] Cattell and Cattell, Op.cit., p.38.

with the former placing emphasis on social interaction. Similarly they state that their Anxiety is not synonymous with Neuroticism.[1]

The conclusion must be then that whilst the variables are similar in nature and very comparable results were obtained on them in this study, they are not identical and the differences in concept behind them, reflected in the questionnaires themselves, are the likely reason for the computed correlations between the variables not being higher than they were.

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[1] Loc.cit.

CHAPTER V

SUMMARY AND CONCLUSIONS

The object of this study was to investigate the possible influences on the personality development of boys age 12-14 through regular participation in individual competitive sport. The study was undertaken because of the lack of any conclusive research evidence based on longitudinal studies on boys of this age range and because of an observed increase in highly organised competitive sport at this age in recent years. The researcher had observed the competitive nature of school age sport in the United States and followed the on going debate there regarding the desirability of highly competitive sport at comparatively early ages. The situation in Britain although by no means so highly developed as in the United States was following the same trend. In particular the commencement of the nationally organised Age Group Swimming Championships in 1966 closely resembled a competitive structure which had been in existence in the United States, and in certain other countries for some years. It seemed very probable therefore that comparable debate regarding the effects of involvement in such a competitive environment would be likely to follow, and to some extent this has proved to be the case. This study was therefore designed to be an attempt to provide some objective evidence on the topic.

In addition to the main area of study investigation was also made of the relative personality development of those boys in the competitive environment who were considered to be successful and those who did not achieve success. A third area of study enquired into whether those boys who dropped out of the competitive scene differed in terms of personality variables to those who continued in competition. Finally a comparison was made between the results obtained in the study from the two personality inventories used.

Comparisons were made with the results from previous studies both of competitors in individual sports and in team sports with regard to the personality of the participants, both at school age and at adult level. However the mainly cross sectional nature, multiplicity of design and measuring instruments and the emphasis on adult subjects of previous studies meant that direct comparisons were not always strictly relevant to this present study.

Summary of Experimental Procedures

The subjects of this study comprised 106 boys who were members of 23 swimming clubs throughout the counties of Northumberland, Durham and Yorkshire and who were regular competitors in the Age Group Swimming Programme at 12 years, 13 years and 14 years of age. These competitive boys were each matched with a boy, who whilst taking part in the normal physical education programme in his school was not a competitor in individual sports either for his school or outside clubs. The boys in the control group were drawn from eight schools in the same geographical area - the N.E. of England. The

boys were matched in terms of chronological and mental age, social background in terms of socio economic class, geographical location and type of educational course being followed, and on physical status - a four item strength battery.

The theoretical base of personality followed in this study was one which recognised the existence of source traits. Personality was measured by using two personality inventories the acceptability of which was well established in previous research. These were Cattell's High School Personality Questionnaire which measures 14 primary personality factors and four second order factors and the Junior Eysenck Personality Questionnaire which measures two higher order personality variables somewhat comparable to two of the four second order factors measured by the H.S.P.Q. and which includes a lie scale which was used to eliminate unreliable subjects.

A continuing check on the development of strength of subjects in the two groups was made by testing annually left grip strength on a manometer.

The research was carefully carried out under non stressful conditions following procedures described in Chapter 3 and in the Appendix, each boy, except those in the Drop Out group, being tested at 12, 13 and 14 years of age as defined in this study.

The obtained results were scored, weighted in the case of the H.S.P.Q. 2nd order factors, and statistically analysed. The analysis of total personality profiles and primary personality factors measured by H.S.P.Q. followed a multivariate procedure the multiple discriminant analyses being processed on the University of Durham IBM 360/67 Computer operated by staff of the computer unit. H.S.P.Q. 2nd order factors,

J.E.P.I. variables and the strength test scores were analysed by univariate procedures, analyses of variance. These were processed on the St.Luke's College, Exeter, Olivetti Programma 101 computer operated by the researcher.

The comparisons made were all of inter group nature as described in Chapter 3. However since such comparisons inevitably mask the results of individuals, analyses were also made on the higher order factors of smaller sub groups composed of those subjects, both competitive and control, who initially at the age of 12 years were more extreme, either high or low, on a factor[1].

Summary of Major Findings

The major findings for each of the four sections of the study are summarised below. Detailed results and discussion have been presented in Chapter 4 and in the Appendix. The term significance again refers to the .05 level with higher values indicated in brackets.

A. Competitive Group v Control Group

The summarised results refer to the total (T) Competitive and Control groups.

1. Total Personality Profile

(i) The personality profile of the Competitive group was not significantly different at 13 years to what it had been at 12 years. There was a significant change at 14 years as compared to 13 years and for the overall period from 12 years to 14 years there was a significant (.01) difference.

[1] See p. 205, paragraph 3

Recurring primary factors which contributed most to the significant discriminant function indicated that the Competitive group became more outgoing, emotionally stable, assertive, and conscientious, generally brighter and less excitable and apprehensive.

(ii) The personality profile of the Control group only revealed a significant (.01) change between the ages of 12 and 14 years. Primary factors with high weighting on this significant discriminant function indicated that like the Competitive group the Control group also became more outgoing, assertive and generally brighter. They were also more group dependent and less controlled.

(iii) At 12 years there was no significant difference between the personality profiles of the two groups. At 13 years and at 14 years the profiles were significantly (.01) different. Primary factors contributing most to the significant function indicated that the Competitive group displayed greater emotional stability and were more assertive and controlled and less excitable, apprehensive and tense than the Control group.

2. Exvia-Invia

The comparisons made of Exvia scores showed that the Competitive group significantly (.01) increased their score between 12-13 years, 13-14 years and overall 12-14 years. The Control group showed a significant (.01) gain in the overall period 12-14 years. At 12 years the Competitive group were already significantly higher on Exvia than were the Control group and the level of significance increased to .01 at 13 and at 14 years.

Those boys both Competitive and Control who were already high on the Exvia scale at 12 years did not change significantly during the period of the study. Of the groups of boys who were initially low on the Exvia scale only the Competitive group showed a significant (.01) gain.

3. Anxiety

The level of Anxiety score of the Competitive group did not change significantly during the study. That of the Control group showed an overall significant gain. The difference between the two groups significant at the .01 level at 12 years remained at this level at 13 years and at 14 years.

The Competitive group who initially scored high on the Anxiety scale at 12 years showed a significant (.01) reduction during the study. In contrast the high scoring Control group did not show significant changes. The initial low scoring groups on Anxiety both Competitive and Control, both significantly (.01) increased their scores between 12 and 14 years.

4. Cortertia-Pathemia

Both Competitive and Control groups showed a significant (.01) gain in Cortertia between 12 and 14 years. There were no significant differences between the groups at either 12, 13 or 14 years.

The extreme scoring groups both Competitive and Control both revealed a trend for scores to move closer to the mean of the Total groups - the initial high scoring groups showing significant reductions, .05 for the Competitive group and

.01 for the Control group, initial low scoring groups both showed significant (.01) gains.

5. Independence

There was no significant change in level of Independence of the Competitive group. In contrast that of the Control group showed a significant gain between 12 and 14 years. The Control group were significantly higher at 12 years and the level increased to .01 at both 13 and 14 years.

The initially high scoring Competitive group showed a significant (.01) reduction in level of Independence whilst the high scoring Control group did not change significantly. Both initially low scoring groups showed significant gains - .05 for the Competitive group and .01 for the Control group.

6. Extraversion (J.E.P.I.)

The Competitive group showed a significant (.01) gain in Extraversion whilst the Control group did not change significantly. There was not a significant difference between the two groups at 12 years but at 13 years the Competitive group were significantly higher and the level of significance had increased to .01 at 14 years.

Both Competitive and Control groups classified as being initially high on both Extraversion and on Neuroticism did not show significant changes on Extraversion. Of the two groups initially high on Extraversion and low on Neuroticism the Competitive group only showed a significant rise on Extraversion.

In contrast comparison of the groups initially low on

Extraversion and high on Neuroticism the Control group only showed a significant gain on Extraversion.

7. Neuroticism

No significant differences were recorded between levels of Neuroticism for either Competitive or Control groups. At 12 years the Competitive group were significantly lower than the Control group. This was also the case at 13 years and at 14 years the difference was at the .01 level.

Of the two groups initially high on both Neuroticism and on Extraversion only the Competitive group showed a significant reduction in level of Neuroticism. Neither group initially high on Neuroticism and low on Extraversion showed any significant change on Neuroticism. Similar gains in Neuroticism were recorded by the groups initially low on Neuroticism and high on Extraversion .05 for the Control group and the Competitive group almost reaching that level.

8. Physical Development - Left Grip Test

Both Competitive and Control groups showed significant (.01) gains in strength. The differences between the groups was significant at 12 years and this level increased to .01 at 14 years with higher mean scores recorded by the Competitive group. The level of scores throughout however remained within the 10% difference within which the groups were originally considered to be matched.

B. Successful v Unsuccessful Competitive Groups

1. Total Personality Profile

(i) The personality profile of the Successful Competitive group was significantly different at 14 years to the profile at 12 years. Primary factors which contributed most to the significant function indicated that this group became more assertive and conscientious, generally brighter and less excitable.

(ii) The personality profile of the Unsuccessful group also showed a significant change at 14 years as compared to that at 12 years. Primary factors with high weightings on the significant function indicated that the Unsuccessful group became more socially bold, less excitable and apprehensive and developed more liking for group action.

(iii) The profiles of the Successful and Unsuccessful groups were not significantly different at 12 years but at 13 years and at 14 years a significant difference was revealed. Primary factors with highest contributions to the significant function indicated that by the end of the study the Successful group were more outgoing, conscientious and individualistic but were not as emotionally stable and were more apprehensive in comparison to the Unsuccessful group.

2. Exvia-Invia

Both the Successful and the Unsuccessful Competitive groups showed significantly (.01) increased levels of Exvia. None of the comparisons between the groups were significant.

3. Anxiety

Neither the Successful nor the Unsuccessful Competitive groups showed any significant change in level of Anxiety and there were no significant differences between the groups.

4. Cortertia-Pathemia

The Successful group did not record any significant change in Cortertia. The Unsuccessful group significantly (.01) increased their level of Cortertia. There were however no significant differences recorded between the groups throughout the study.

5. Independence

The Successful Competitive group did not record a significant change in Independence. The level of Independence of the Unsuccessful group showed a significant drop but throughout the study none of the differences between the two groups reached significant levels.

6. Extraversion (J.E.P.I.)

The level of Extraversion recorded by the Successful group did not change significantly during the study. That of the Unsuccessful group showed a significant .01 gain. However none of the between group differences reached significant levels.

7. Neuroticism

The level of Neuroticism recorded by the Successful group did not change significantly during the study. A significant reduction in Neuroticism was recorded by the Unsuccessful group. Again none of the between group differences reached significant levels.

8. Physical Development - Left Grip Test

Both the Successful and the Unsuccessful groups significantly (.01) increased their strength scores throughout the study. The Successful group were already significantly higher on strength at the commencement of the study at 12 years and this difference was still apparent at 14 years of age.

C. Competitive Drop Out Group

1. Total Personality Profile

The personality profile of the Competitive Drop Out group at 12 years was not significantly different from that of either the Successful or Unsuccessful Competitive groups at that age.

2. H.S.P.Q. 2nd Order Factors

At 12 years of age no significant differences between the mean scores on any of the four second order factors were recorded in the comparison of the Competitive Drop Out group and the Successful Competitive group nor in comparison with the Unsuccessful Competitive group.

3. J.E.P.I. Variables Extraversion-Introversion and Neuroticism

At 12 years of age the Competitive Drop Out group was not significantly different on Extraversion nor on Neuroticism from either the Successful or the Unsuccessful Competitive group.

4. Physical Development - Left Grip Test

The mean score on the left grip strength test of the

Competitive Drop Out group did not differ significantly from that of either the Successful nor the Unsuccessful Competitive groups.

D. Comparison of Results from H.S.P.Q. (Cattell) and J.E.P.I. (Eysenck)

The general trends of comparisons of Competitive and Control groups on Exvia and Extraversion and on Anxiety and Neuroticism had been very comparable.

Product moment correlations for both groups at each age level had revealed three significant at .01, one at .05 and two non significant results in the correlation between Exvia and Extraversion. All six correlations between Anxiety and Neuroticism were significant at the .01 level of confidence.

Conclusions

The conclusions below are based on the results of this present study and relate to groups and procedures as described in Chapter 3 and in the Appendix.

1. The personality of boys aged 12-14 did change over this period of time, the results from this study thus support those such as Cattell and Cattell[1] who have indicated that measurable changes do occur.

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[1] Raymond B.Cattell and Mary D.L.Cattell, Handbook for the Junior Senior High School Personality Questionnaire, Champaign, 1969, p.43.

2. The Competitive group showed more marked personality changes than did the Control group. These changes indicated that they became more emotionally stable, assertive and controlled and less excitable, apprehensive and tense. They became more extravert and showed reduced anxiety and neurotic tendencies than the Control group. The competitive environment seemed to have no effect on Cortertia but was detrimental to the development of Independence.

With the exception of the Independence factor all the other changes evidenced by the Competitive group were considered to be desirable within the context of improved mental health.[1] With regard to Independence it is suggested that the heavy reliance placed on adult coaches and administrators by Competitive Age Group swimmers may detract from the development of this factor in the group of boys concerned. Change to remedy this should not be too difficult and it is suggested that the boys should be encouraged to participate more themselves in planning programmes, training sessions and club activities, and helped to develop higher levels of critical judgement.

In view of the finding on this factor some coaches may need to ask themselves how much truth there is in the contention of Rushall[2] that coaches may try to develop dependency in swimmers for their own ego satisfaction.

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[1] See page 193

[2] B.S.Rushall, Preliminary Personality Work with Swimmers, British Swimming Coaches Bulletin 44, 1967, pp.7-27.

The results from this study support those such as Ryan (p. 31), Ogilvie and Tutko (p. 33) and Clark (p. 33) who have stated that personality is shaped through participation in competitive sport.

3. It is not possible to distinguish at 12 years of age groups of competitive boys who will subsequently prove to be successful or unsuccessful or who will drop out of competition, through comparisons on personality variables as measured by the tests used in this study.

4. Initial level of strength at 12 years did differentiate between groups of boys who were to prove successful and unsuccessful between the ages of 12 and 14 years, the successful boys having a higher level of strength and being possibly physiologically more mature.

5. The achievement or lack of achievement of success did not have any detrimental effect on the development of personality of those boys who remained in competition. It may be of course that the definition of successful used in this study was too broadly based or again even those boys who were unsuccessful within the age group programme may have been achieving sufficient more localised success, e.g. at school and local club to find satisfaction. However the results within the context of this study support the view of Ogilvie and Tutko[1] that there is value in permitting

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[1] Bruce C. Ogilvie and Thomas A. Tutko, Problem Athletes and How to Handle Them, London, Pelham Books, 1966, p.70.

children to fail without near or complete collapse of their self concept.

6. The reduction in H.S.P.Q. Primary factor O - Guilt Proneness by the Unsuccessful Competitive group indicates that the suggested reason for some competitors being habitual losers due to having feelings of guilt over deafeating opponents[1], does not apply to groups of competitive boys of this age range.

7. This study has been concerned with change in personality structure during a period of competition. No attempt was made to match competitive and control groups on personality variables but statistical procedures were followed which took into account initial differences. In fact there were differences in higher order personality variables between the groups at 12 years and it was not possible to say whether these had arisen at least in part as a result of earlier association with a competitive environment or whether boys already evidencing particular personality variables were drawn to the competitive scene. A different experimental design would be necessary to determine this.

8. It would appear that the two personality inventories used, H.S.P.Q. and J.E.P.I., are measuring comparable but not identical higher personality variables in terms of Exvia-Extraversion and Anxiety-Neuroticism. There was a less close relationship between the first two variables most

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[1] See pages 52-53.

probably due to higher emphasis on sociability in the Envia scale.

9. In view of the matching which took place between the groups at 12 years an interesting topic for future study would be to enquire whether the differences in development of personality variables of the Competitive and Control groups will be reflected in their respective levels of school attainment. At present this can only be a matter of conjecture.

Although previous research on the relationship of personality variables to scholastic attainment has yielded some conflicting results the concensus for boys of school age would appear to link stable-intraversion with success. Such a relationship was found by Child[1] and by Entwistle and Cunningham[2], - Rushton[3] whilst finding comparable results in a relation of low Anxiety with success found that extraversion correlated with success. However Entwistle and Cunningham[4] suggested that this may have been due to the grouping of boys and girls together since in their study the result for

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[1]Dennis Child, "The Relationships Between Intraversion-Extraversion, Neuroticism and Performance in School Examinations", British Journal Educational Psychology 24:2,(June 1964) pp.187-196.

[2]N.J.Entwistle and Shirley Cunningham, "Neuroticism and School Attainment - A Linear Relationship" British Journal Educational Psychology 38:2 (June 1968), pp.123-132.

[3]James Rushton, "The Relationship Between Personality Variables and Scholstic Success in 11 Year Old Children", British Journal Educational Psychology 36:2 (June 1966) pp.178-184.

[4]Entwistle and Cunningham, loc.cit.

girls had shown a relationship between stable extraversion and success.

With regard to H.S.P.Q. primary factors, in addition to B - Intelligence, those which have been found to correlate highly with attainment were G - Super Ego Strength and Q_2 - Self-Sufficiency in a study by Butcher, Ainsworth and Nesbitt[1]; G, Q_2 and I - Harria in Porter's[2] study; C - Ego-strength, F - Surgency and G - Super Ego Strength in Rushton's study[3] and G and Q_3 - Self Sentiment in a study by Cattell Sealey and Sweney[4].

In this present study there would appear to be contrary trends on personality variables contributing to success evidenced by the two groups. Greater stability but also greater extraversion, greater Super Ego Strength but less Self Sufficiency being evidenced by the Competitive group. Further worthwhile research with these groups is indicated.

10. Implicit in the discussion outlined in Chapter 1 with regard to the possible effect there might be on the developing personality of boys through regular participation in

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[1]H.J.Butcher, M.Ainsworth and J.E.Nesbitt, "Personality Factors and School Achievement - A Comparison of British and American Children", British Journal of Educational Psychology 33:3 (November 1963), pp.276-285.

[2]Rutherford B.Porter, "A Comparative Investigation of Sixth Grade Gifted Children with a Norm Group of Children", Journal of Educational Research 58:3 (November 1964), pp.132-134.

[3]Rushton, Loc.cit.

[4]R.B.Cattell, A.P.Sealey and A.B.Sweney, "What Can Personality and Motivational Source Trait Measurement add to the Prediction of School Achievement", British Journal of Educational Psychology 36:3 (November 1966), pp.280-295.

competitive sport is the question of whether or not the pursuit of competitive sport should be encouraged or discouraged.

The whole ethic of competition in sport and in education generally has been challenged, e.g. by Sherif[1] and by Leach[2]. Opposing views have been expressed, Storr[3] for instance being strongly in favour of competition in society. Even such a strong supporter of co-operative ventures as Bertrand Russell[4] was able to perceive some value in sport for young persons who desired it. Those who have expressed support for competitive sport as a desirable pursuit have done so on a variety of grounds. Beisser[5] considered sport to be both a bridge across adolescence to manhood and a display of masculinity, and Schendel[6] saw it as a means of self expression and self realization. Others such as Pickford[7]

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[1]Muzafer Sherif, Group Conflict and Co-operation - Their Social Psychology, London, Routledge, Kegan Paul, (1967), p.87.

[2]Edmund Leach, "Men and Learning" Reith Lecture 5, The Listener,(14th December 1967) p.780.

[3]Anthony Storr, Human Aggression, London, Penguin Press, 1968, pp.58 and 117.

[4]Bertrand Russell, Has Man a Future? London, Allen and Unwin, 1961, pp.131-134.

[5]Arnold R.Beisser, The Madness in Sport, New York, Appleton Century Crofts, 1967, pp.223-225.

[6]Jack Schendel, "The High School Athlete Drop Out", Proceedings National Collegiate Physical Education Association, 1969, pp.68-70.

[7]R.W.Pickford, "Aspects of the Psychology of Games and Sports", British Journal of Psychology 31,4 (April 1941), p.284.

McCleary and McDonough[1], Barrett[2] and Mahoney[3] have stressed the competitive nature of life in the western world and the part that competitive sport may play in preparing children to meet the inevitable successes and failures of life. Selye's[4] support for competitive sport was for its value as an antidote to the stresses of life.

Only one aspect of the problem has been pursued in this study, that of possible effects on personality. The results on the whole point to beneficial consequences rather than the reverse - one exception has been noted and suggestions to counteract this influence have been made. With this proviso the results from this study support the organisation of individual competitive sport for those boys 12-14 who choose to participate.

The competitive nature of children's play is well documented, for instance by Opie[5], and were competitive sport not organised for them there is little doubt that boys of the last decades of the 20th Century would follow the example of their predecessors in the early decades of the 19th Century

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[1] I.S.McCleary and T.D.McDonough, "Competition and Co-operation", The Physical Educator 20:1 (March 1963), pp9-11.

[2] H.C.Barrett, "Can Competitive Pressures Affect a Child?", Journal Canadian Association Health Physical Education and Recreation 32:3, 1966, p.8.

[3] D.Mahoney, "Reasons for Swimming Competitively", Swimming World 10:2, (February 1969), p.9.

[4] Hans Selye, The Stress of Life, New York, Longmans Green & Co., 1956, p.268.

[5] Iona and Peter Opie, Children's Games in Street and Playground, Oxford, Clarendon Press, 1969, pp.371.

and organise competitions for themselves. The urge to compete, to excel, to measure ability against an opponent, measuring tape, clock or natural hazards seems to be basic in a great many children. Possibly no better conclusion can be given than to quote from a firm supporter of competitive sport for the young, Dr. Roger Bannister[1]:

> "The urge to struggle lies latent in everyone. The more restricted our society and work become, the more necessary it will be to find an outlet for this craving for freedom. No one can say "You must not run (or swim) faster than this or jump higher than that"."

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[1] Roger Bannister, The First Four Minutes, London, Pitman & Co., 1955, p.222.

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APPENDIX

APPENDIX

TABLES OF RESULTS

A detailed list of tables is given on pages vii to xiii at the front of this thesis.

Tables 5.1 - 5.36 give results of the comparisons made between the Competitive and Control Groups.

Tables 6.1 - 6.12 give results of the comparisons made between Successful and Unsuccessful Competitive Groups.

Tables 7.1 - 7.16 give results of comparisons made between Successful Competitors and the Drop-Out Group and between Unsuccessful Competitors and the Drop-Out Group.

Interpretation of the Multiple Discriminant Analysis Tables (Tables 5.7-5.15, 6.3-6.5 and 7.2)

In this present study the information required from each multiple discriminant analysis was whether there was a significant function which would discriminate between the groups being compared and if so which of the fourteen variables had the greatest contributions to the function. The computations were continued until the required information was extracted.

The tables indicate whether or not the obtained Wilks Lambda is significant and if so at what level of confidence. The relative contribution of the variables to the discriminant function is indicated by the size of the scaled vectors. It should be noted that following the procedures detailed by Cooley and Lohnes[1] the scaled vectors are the product of the eigenvector (the coefficient of the discriminant function) and the square root of the corresponding element in the pooled within groups matrix. The size of the latter is related to the size of the sample. Cross reference to the actual sizes of these scaled vectors should only be made when the numbers in the different sample populations are equivalent.

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[1] William W.Cooley and Paul R.Lohnes, Multivariate Procedures for the Behavioural Sciences, New York, John Wiley and Sons Inc., 1962, p.118.

TABLE 5.1

H.S.P.Q. Primary Factors, Means and Standard Deviations for Competitive Group A at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	10.17	2.69	11.11	3.95	11.93	4.28
B	6.61	1.59	7.09	1.34	7.24	1.58
C	10.17	2.66	10.35	3.55	10.72	3.93
D	11.07	3.15	11.13	4.10	9.48	4.11
E	10.28	3.34	10.89	3.04	12.11	2.98
F	11.06	3.75	11.94	3.52	12.69	3.44
G	10.61	3.21	10.54	3.35	11.02	2.99
H	10.96	3.38	10.54	4.08	12.15	4.26
I	7.44	2.79	6.22	2.81	6.19	3.39
J	8.09	3.13	7.76	2.79	7.22	3.25
Q_1	10.78	2.45	10.44	3.35	9.41	3.04
Q_2	11.04	2.95	10.50	2.99	9.70	3.50
Q_3	11.39	2.81	11.54	2.83	10.70	2.89
Q_4	8.67	2.73	8.91	3.34	8.33	3.44

TABLE 5.2

H.S.P.Q. Primary Factors, Means and Standard Deviations for Competitive Group B at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	10.35	4.09	11.08	3.56	11.85	3.13
B	6.60	1.74	6.85	1.39	7.44	1.42
C	9.60	3.19	10.52	3.62	10.37	3.24
D	11.17	3.26	10.65	3.22	10.31	2.71
E	8.96	3.30	10.73	2.83	11.90	2.93
F	10.63	3.09	11.52	2.99	11.73	3.32
G	10.48	2.71	10.90	3.34	11.19	3.45
H	10.23	3.11	10.88	3.07	10.67	3.37
I	6.44	3.26	5.90	3.43	5.96	3.21
J	7.63	3.40	7.50	3.73	6.98	3.38
Q_1	10.10	2.99	10.08	3.29	9.33	2.75
Q_2	9.94	2.43	10.75	3.15	10.04	3.11
Q_3	11.35	2.61	11.31	2.74	10.81	2.93
Q_4	8.38	3.11	8.77	3.44	8.60	3.07

TABLE 5.3

H.S.P.Q. Primary Factors, Means and Standard Deviations for Competitive Group T at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	10.25	3.43	11.09	3.75	11.89	3.74
B	6.60	1.66	6.97	1.36	7.34	1.50
C	9.89	2.93	10.43	3.57	10.55	3.59
D	11.12	3.19	10.90	3.69	9.89	3.50
E	9.63	3.37	10.81	2.92	12.01	2.95
F	10.85	3.43	11.74	3.26	12.22	3.40
G	10.55	2.96	10.72	3.33	11.10	3.21
H	10.60	3.26	10.71	3.30	11.42	3.90
I	6.95	3.05	6.07	3.12	6.08	3.29
J	7.87	3.26	7.63	3.27	7.10	3.30
O	10.44	2.74	10.26	3.31	9.37	2.89
Q_2	10.50	2.75	10.62	3.06	9.87	3.30
Q_3	11.37	2.70	11.42	2.78	10.75	2.89
Q_4	8.58	2.91	8.84	3.38	8.46	3.25

TABLE 5.4

H.S.P.Q. Primary Factors, Means and Standard Deviations for Control Group A at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	9.24	2.88	10.17	3.18	10.29	3.54
B	6.69	1.61	6.85	1.45	7.22	1.31
C	8.72	3.58	8.00	3.14	8.56	4.27
D	12.33	2.63	12.78	3.33	13.06	3.63
E	9.70	3.46	10.13	2.76	11.35	3.51
F	10.51	3.18	10.94	3.29	10.94	3.58
G	10.11	2.77	10.04	3.51	8.93	3.53
H	9.07	3.26	8.87	3.20	8.50	4.41
I	7.41	3.07	7.20	2.87	7.04	3.31
J	8.29	2.63	8.65	2.57	8.15	3.50
O	11.72	2.82	12.22	3.29	12.29	3.35
Q_2	11.19	2.84	11.07	2.79	11.17	3.19
Q_3	10.61	3.09	10.28	2.85	9.19	2.74
Q_4	9.57	3.12	10.09	2.88	10.69	3.32

TABLE 5.5

H.S.P.Q. Primary Factors, Means and Standard Deviations for Control Group B at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	8.94	3.48	9.42	3.73	9.98	3.62
B	6.69	1.38	7.01	1.33	7.27	1.25
C	8.94	2.80	8.50	3.98	8.83	4.40
D	12.46	3.32	12.65	3.37	12.81	3.93
E	9.40	3.75	10.00	3.22	10.90	3.48
F	10.07	3.58	11.38	2.95	11.46	3.88
G	9.61	2.93	9.02	3.32	9.46	2.98
H	8.67	3.23	8.67	3.05	9.29	4.42
I	7.23	2.79	6.40	3.26	6.67	3.72
J	7.88	2.93	8.62	2.85	8.17	3.14
C	10.65	3.27	11.65	3.35	10.71	3.95
Q_2	10.90	3.19	11.02	2.75	11.60	3.12
Q_3	10.44	2.80	10.48	3.42	10.19	2.97
Q_4	9.83	2.84	9.69	3.79	9.60	3.90

TABLE 5.6

H.S.P.Q. Primary Factors, Means and Standard Deviations for Control Group T at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	9.09	3.18	9.80	3.47	10.14	3.57
B	6.69	1.50	6.93	1.39	7.25	1.28
C	8.83	3.21	8.25	3.60	8.69	4.31
D	12.40	2.98	12.72	3.34	12.69	3.78
E	9.56	3.59	10.07	2.98	11.13	3.49
F	10.31	3.37	11.16	3.12	11.20	3.72
G	9.87	2.85	9.54	3.44	9.19	3.27
H	8.88	3.24	8.77	3.40	8.89	4.41
I	7.32	2.93	6.81	3.08	6.86	3.51
J	8.09	2.78	8.63	2.70	8.16	3.31
C	11.20	3.08	11.94	3.32	11.52	3.72
Q_2	11.05	3.01	11.05	2.76	11.38	3.15
Q_3	10.53	2.94	10.38	3.13	9.68	2.89
Q_4	9.70	2.97	9.90	3.35	10.15	3.64

TABLE 5.7

N.S.P.C.C. Total Personality Profile, Multiple Discriminant Analyses of Competitive Group A

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.1149	0.1674	0.3391
df	14	14	14
Chi Square	10.88	15.45	29.19
p	N.S.	N.S.	.01
Wilks Lambda	0.8969	0.8566	0.7468
df	14 & 93	14 & 93	14 & 93
F	0.76	1.11	2.25
p	N.S.	N.S.	.02
Scaled Vectors			
A	5.59	-2.29	9.04
B	10.15	6.17	8.27
C	-1.40	-8.79	-11.60
D	5.24	-17.98	-12.92
E	1.25	10.29	8.05
F	5.73	-6.01	4.93
G	2.58	5.98	4.57
H	-11.26	14.30	-3.52
I	-15.32	3.67	-6.28
J	-2.82	-2.89	0.68
O	-5.59	-2.92	-12.57
Q_2	-1.99	-0.81	-2.49
Q_3	6.82	-14.91	-7.29
Q_4	1.82	5.69	5.66

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14&93	1.82	2.32

TABLE 5.8

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Competitive Group B

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.2341	0.2879	0.5891
df	14	14	14
Chi Square	20.18	24.32	44.47
p	N.S.	.05	.01
Wilks Lambda	0.8103	0.7765	0.6293
df	14 & 89	14 & 89	14 & 89
F	1.49	1.83	3.75
p	N.S.	.05	.01
Scaled Vectors			
A	5.00	5.73	4.14
B	7.39	10.74	11.99
C	10.80	-3.53	0.47
D	-8.71	-5.14	-6.86
E	14.64	10.82	15.49
F	5.92	-2.27	0.16
G	5.53	-0.18	5.53
H	-1.45	-10.36	-7.55
I	2.46	4.21	2.61
J	4.74	2.03	1.55
O	9.54	8.05	-2.60
Q_2	7.20	-2.71	-0.18
Q_3	3.25	-3.96	-2.45
Q_4	11.12	0.28	5.11

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 89	1.82	2.93

TABLE 5.9

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Competitive Group I

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.0985	0.1360	0.3530
df	14	14	14
Chi Square	19.14	25.99	61.67
p	N.S.	.05	.01
Wilks Lambda	0.9103	0.8803	0.7391
df	14 & 197	14 & 197	14 & 197
F	1.39	1.91	4.97
p	N.S.	.05	.01
Scaled Vectors			
A	11.49	4.75	9.76
B	13.20	14.51	16.25
C	11.78	-8.96	-3.84
D	-2.32	-16.72	-13.98
E	20.56	16.56	19.65
F	10.41	-6.34	2.88
G	8.65	5.18	10.08
H	-9.75	-1.42	-7.73
I	-12.05	5.20	-2.14
J	3.30	-0.94	0.29
O	3.55	-10.19	-8.62
Q_2	8.48	-3.91	-0.06
Q_3	4.87	-13.87	-7.76
Q_4	11.07	3.04	7.69

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 197	1.76	2.21

TABLE 5.10

E.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Control Group A

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.0907	0.1729	0.2609
df	14	14	14
Chi Square	8.72	15.96	23.19
P	N.S.	N.S.	N.S.
Wilks Lambda	0.9168	0.8526	0.7931
df	14 & 93	14 & 93	14 & 93
F	0.80	1.15	1.73
p	N.S.	N.S.	N.S.
Scaled Vectors			
A	-13.12	0.80	-11.91
B	-2.56	-9.31	-10.25
C	12.80	-14.80	-0.10
D	6.70	5.25	5.91
E	-4.24	-7.00	-8.20
F	-4.51	4.91	3.85
G	-7.86	9.71	6.80
H	0.57	2.98	1.87
I	7.93	-1.24	4.15
J	-12.82	6.05	-0.68
Q	-0.99	0.68	-1.86
C_2	6.77	-5.32	-0.58
C_3	6.26	11.28	12.82
C_4	-10.96	-6.17	-8.68

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 93	1.82	2.32

TABLE 5.11

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Control Group B

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.1914	0.1558	0.2167
df	14	14	14
Chi Square	16.79	13.92	18.84
p	N.S.	N.S.	N.S.
Wilks Lambda	0.8394	0.8652	0.8219
df	14 & 89	14 & 89	14 & 89
F	1.22	0.99	1.38
p	N.S.	N.S.	N.S.
Scaled Vectors			
A	-1.61	10.78	4.57
B	-10.29	2.05	11.41
C	3.58	-5.92	-6.67
D	1.65	-1.27	-5.61
E	-5.54	11.51	8.88
F	-9.47	-3.69	5.85
G	6.36	5.64	-1.27
H	-3.05	0.12	5.59
I	7.31	10.33	-1.92
J	-5.27	-10.51	2.02
C_1	-11.46	-14.66	4.02
C_2	-2.03	14.35	7.69
C_3	-6.31	-4.52	2.70
C_4	5.73	10.34	1.71

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 89	1.82	2.32

TABLE 5.12

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Control Group T

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.0844	0.1078	0.1647
df	14	14	14
Chi Square	16.16	20.87	31.17
P	N.S.	N.S.	.01
Wilks Lambda	0.9221	0.9027	0.8586
df	14 & 197	14 & 197	14 & 197
F	1.19	1.52	2.32
p	N.S.	N.S.	.01
Scaled Vectors			
A	-11.73	6.37	11.65
B	-10.56	12.18	16.81
C	13.09	8.56	-2.51
D	5.82	-5.12	-7.46
E	-8.99	13.17	13.12
F	-16.27	-6.42	3.92
G	3.12	-6.42	-7.71
H	-0.66	-0.08	2.38
I	16.80	10.27	-2.97
J	-15.45	-13.38	0.99
O	-16.40	-11.92	3.31
Q_2	1.30	14.78	10.48
Q_3	-4.88	-12.25	-8.53
Q_4	-0.99	11.51	5.87

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 197	1.76	2.21

TABLE 5.13

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Competitive and Control Groups A

	C v N 12 Years	C v N 13 Years	C v N 14 Years
Eigenvalue	0.1275	0.2278	0.4525
df	14	14	14
Chi Square	12.03	20.53	37.37
p	N.S.	N.S.	.01
Wilks Lambda	0.8869	0.8145	0.6885
df	14 & 93	14 & 93	14 & 93
F	0.85	1.51	3.01
p	N.S.	N.S.	.01
Scaled Vectors			
A	6.64	-2.71	-7.73
B	-4.17	10.01	7.25
C	7.27	14.32	-10.35
D	-12.41	1.03	-9.67
E	9.23	7.81	3.82
F	-0.36	1.96	14.05
G	-0.74	-8.00	4.42
H	22.39	1.50	3.47
I	8.21	-3.95	5.00
J	3.86	-3.32	0.29
O	-5.85	-6.18	-15.13
Q_2	-3.77	2.67	2.29
Q_3	2.72	10.22	10.09
Q_4	-0.23	-3.72	-8.79

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 93	1.82	2.32

TABLE 5.14

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Competitive and Control Groups 3

	C v N 12 Years	C v N 13 Years	C v N 14 Years
Eigenvalue	0.1909	0.2339	0.2786
df	14	14	14
Chi Square	16.79	20.18	23.64
p	N.S.	N.S.	N.S.
Wilks Lambda	0.8398	0.8104	0.7821
df	14 & 89	14 & 89	14 & 89
F	1.21	1.49	1.77
p	N.S.	N.S.	N.S.
Scaled Vectors			
A	8.21	11.39	10.14
B	-4.43	-5.40	5.75
C	1.50	3.79	-6.77
D	0.81	-11.54	-18.47
E	-5.05	6.21	11.68
F	1.25	-7.55	-3.55
G	4.13	15.15	6.43
H	12.86	13.04	-5.24
I	-6.16	1.48	3.51
J	8.45	-2.54	-2.92
O	6.59	3.57	-5.16
Q_2	-13.31	1.61	-9.11
Q_3	11.10	-2.12	0.03
Q_4	-11.09	13.68	7.74

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 89	1.82	2.32

TABLE 5.15

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Competitive and Control Groups T

	C v N 12 Years	C v N 13 Years	C v N 14 Years
Eigenvalue	0.1231	0.1566	0.2764
df	14	14	14
Chi Square	23.64	29.76	49.74
p	N.S.	.01	.01
Wilks Lambda	0.8904	0.8646	0.7835
df	14 & 197	14 & 197	14 & 197
F	1.73	2.20	3.89
p	N.S.	.01	.01
Scaled Vectors			
A	13.11	6.83	5.72
B	-6.65	9.21	9.64
C	6.81	21.23	-16.47
D	-12.50	-16.53	-29.65
E	-0.09	17.98	9.87
F	2.49	-1.17	8.24
G	3.09	3.72	11.14
H	26.32	13.16	-1.21
I	0.76	-4.06	6.05
J	9.41	-3.87	-3.52
O	-0.13	-7.28	-17.74
Q_2	-17.65	3.66	-8.53
Q_3	15.91	13.94	7.57
Q_4	-8.78	14.89	6.14

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 197	1.76	2.21

TABLE 5.16

Exvia-Invia

Comparison of Competitive and Control Groups A, B and T at 12, 13 and 14 Years

	A		B		T	
	Mean	SD	Mean	SD	Mean	SD
Competitive Group						
12 Years	6.03	2.09	5.61	2.44	5.82	2.27
13 Years	6.59	2.57	6.64	2.32	6.62	2.44
14 Years	7.78	2.76	7.11	2.57	7.45	2.67
Control Group						
12 Years	5.03	2.16	5.00	2.29	5.01	2.22
13 Years	5.26	2.16	5.43	2.43	5.34	2.29
14 Years	5.65	3.03	5.85	2.76	5.75	2.89

Analysis of Variance	df	F	p	df	F	p	df	F	p
C12 v C13	1&53	2.61	NS	1&51	12.32	.01	1&105	12.88	.01
C13 v C14	1&53	16.25	.01	1&51	3.83	NS	1&105	17.72	.01
C13 v C14	1&53	19.55	.01	1&51	17.77	.01	1&105	37.35	.01
N12 v N13	1&53	1.29	NS	1&51	2.02	NS	1&105	3.34	NS
N13 v N14	1&53	1.24	NS	1&51	2.31	NS	1&105	3.35	NS
N12 v N14	1&53	3.36	NS	1&51	7.25	.01	1&105	9.95	.01
C12 v N12 Covariance	1&106	5.98	.05	1&102	1.53	NS	1&210	6.72	.05
C13 v N13	1&105	8.34	.01	1&101	7.13	.01	1&209	15.11	.01
C14 v N14	1&105	14.59	.01	1&101	5.45	.05	1&209	19.06	.01

F ratios required for significance	df	.05	.01
	1&51	4.03	7.17
	1&53	4.02	7.14
	1&101 to 1&106	3.94	6.90
	1&209 to 1&210	3.89	6.76

TABLE 5.17

Luvia - Initial High Scorers

Comparison of Competitive and Control Groups at 12, 13 and 14 Years

	Mean	SD
Competitive Group Initially Scoring High		
12 Years	9.05	0.63
13 Years	8.59	2.14
14 Years	8.66	2.43
Control Group Initially Scoring High		
12 Years	8.63	1.01
13 Years	7.98	1.42
14 Years	8.45	2.53

Analysis of Variance	df	F	p
CIH12 v CIH13	1 & 16	0.97	N.S.
CIH13 v CIH14	1 & 16	0.15	N.S.
CIH12 v CIH14	1 & 16	0.59	N.S.
NIH12 v NIH13	1 & 16	3.01	N.S.
NIH13 v NIH14	1 & 16	1.05	N.S.
NIH12 v NIH14	1 & 16	0.15	N.S.
CIH12 v NIH12 Covariance	1 & 32	2.14	N.S.
CIH13 v NIH13	1 & 31	0.88	N.S.
CIH14 v NIH14	1 & 31	0.04	N.S.

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.18

Envia - Initial Low Scorers

Comparison of Competitive and Control Groups at 12, 13 and 14 Years

	Mean	SD
Competitive Group Initially Scoring Low		
12 Years	2.27	0.94
13 Years	4.44	2.35
14 Years	5.33	3.12
Control Group Initially Scoring Low		
12 Years	1.90	0.63
13 Years	3.01	1.55
14 Years	2.93	2.59

Analysis of Variance	df	F	p
CIL12 v CIL13	1 & 16	11.83	.01
CIL13 v CIL14	1 & 16	4.30	N.S.
CIL12 v CIL14	1 & 16	16.03	.01
NIL12 v NIL13	1 & 16	9.42	.01
NIL13 v NIL14	1 & 16	0.07	N.S.
NIL12 v NIL14	1 & 16	3.00	N.S.
CIL12 v NIL12	1 & 32	1.79	N.S.
Covariance			
CIL13 v NIL13	1 & 31	4.21	.05
CIL14 v NIL14	1 & 31	5.70	.05

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.19

Anxiety

Comparison of Competitive and Control Groups A, B and T at 12, 13 and 14 Years

	A		B		T	
	Mean	SD	Mean	SD	Mean	SD
Competitive Group						
12 Years	5.07	1.86	5.29	1.71	5.18	1.78
13 Years	5.21	2.08	4.95	1.99	5.08	2.04
14 Years	4.72	2.09	5.04	1.86	4.88	1.98
Control Group						
12 Years	6.06	1.77	5.98	1.59	6.02	1.68
13 Years	6.44	2.07	6.32	2.37	6.38	2.22
14 Years	6.79	2.07	6.11	2.37	6.45	2.42

Analysis of Variance	df	F	p	df	F	p	df	F	p
C12 v C13	1&53	0.23	NS	1&51	1.77	NS	1&105	1.12	NS
C13 v C14	1&53	6.19	.05	1&51	0.31	NS	1&105	2.26	NS
C12 v C14	1&53	1.28	NS	1&51	1.07	NS	1&105	2.57	NS
N12 v N13	1&53	2.47	NS	1&51	1.86	NS	1&105	4.19	.05
N13 v N14	1&53	1.86	NS	1&51	1.27	NS	1&105	1.03	NS
N12 v N14	1&53	6.18	.05	1&51	0.17	NS	1&105	4.65	.05
C12 v N12 Covariance	1&106	7.52	.01	1&102	4.59	.05	1&210	12.60	.01
C13 v N13	1&105	9.24	.01	1&101	10.05	.01	1&209	19.49	.01
C14 v N14	1&105	26.46	.01	1&101	5.35	.05	1&209	26.68	.01

F ratios required for significance	df	.05	.01
	1&51	4.03	7.17
	1&53	4.02	7.14
	1&101 to 1&106	3.94	6.90
	1&209 to 1&210	3.89	6.76

TABLE 5.20

Anxiety - Initial High Scorers

Comparison of Competitive and Control

Groups at 12, 13 and 14 Years

	Mean	S.D.
Competitive Group Initially Scoring High		
12 Years	7.75	0.54
13 Years	6.15	1.69
14 Years	5.79	1.77
Control Group Initially Scoring High		
12 Years	8.46	0.82
13 Years	8.06	2.07
14 Years	7.64	2.08

Analysis of Variance	df	F	p
CHH12 v CHH13	1 & 16	21.17	.01
CHH13 v CHH14	1 & 16	1.03	N.S.
CHH12 v CHH14	1 & 16	26.34	.01
NIH12 v NIH13	1 & 16	0.91	N.S.
NIH13 v NIH14	1 & 16	0.75	N.S.
NIH12 v NIH14	1 & 16	3.07	N.S.
CHH12 v NIH12 Covariance	1 & 32	9.09	.01
CHH13 v NIH13	1 & 31	7.39	.05
CHH14 v NIH14	1 & 31	8.16	.01

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.21

Anxiety - Initial Low Scorers

Comparison of Competitive and Control

Groups at 12, 13 and 14 Years

	Mean	SD
Competitive Group Initially Scoring Low		
12 Years	2.35	0.82
13 Years	3.42	2.25
14 Years	3.92	1.99
Control Group Initially Scoring Low		
12 Years	3.46	0.64
13 Years	4.98	1.91
14 Years	5.19	2.46

Analysis of Variance	df	F	p
CIL12 v CIL13	1 & 16	3.82	N.S.
CIL13 v CIL14	1 & 16	1.15	N.S.
CIL12 v CIL14	1 & 16	11.90	.01
NIL12 v NIL13	1 & 16	14.41	.01
NIL13 v NIL14	1 & 16	0.21	N.S.
NIL12 v NIL14	1 & 16	7.22	.05
CIL12 v NIL12 Covariance	1 & 32	19.14	.01
CIL13 v NIL13	1 & 31	4.28	.05
CIL14 v NIL14	1 & 31	2.56	N.S.

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.22

Cortertia

Comparison of Competitive and Control Groups A, B and T at 12, 13 and 14 Years

	A		B		T	
	Mean	SD	Mean	SD	Mean	SD
Competitive Group						
12 Years	5.59	1.43	5.17	1.69	5.39	1.56
13 Years	5.72	1.55	5.87	1.43	5.79	1.49
14 Years	6.39	1.53	6.07	1.97	6.23	1.75
Control Group						
12 Years	5.30	1.63	5.45	1.70	5.38	1.66
13 Years	5.25	1.64	5.66	1.89	5.45	1.77
14 Years	6.03	1.58	5.74	1.78	5.89	1.68

Analysis of Variance	df	F	p	df	F	p	df	F	p
C12 v C13	1&53	0.37	NS	1&51	8.89	.01	1&105	6.78	.05
C13 v C14	1&53	7.68	.01	1&51	0.71	NS	1&105	3.87	.05
C12 v C14	1&53	9.62	.01	1&51	8.99	.01	1&105	19.36	.01
N12 v N13	1&53	0.05	NS	1&51	1.08	NS	1&105	1.13	NS
N13 v N14	1&53	9.99	.01	1&51	0.17	NS	1&105	6.47	.05
N12 v N14	1&53	6.49	.05	1&51	1.44	NS	1&105	7.86	.01
C12 v N12	1&106	0.99	NS	1&102	0.51	NS	1&210	0.00	NS
Covariance									
C13 v N13	1&105	2.30	NS	1&101	0.02	NS	1&209	2.19	NS
C14 v N14	1&105	1.41	NS	1&101	0.74	NS	1&209	3.08	NS

	df	.05	.01
F ratios required for significance	1&51	4.03	7.17
	1&53	4.02	7.14
	1&101 to 1&106	3.94	6.90
	1&209 to 1&210	3.89	6.76

TABLE 5.23

Cortertia - Initial High Scorers
Comparison of Competitive and Control Groups at 12, 13 and 14 Years

	Mean	SD
Competitive Group Initially Scoring High		
12 Years	7.74	0.51
13 Years	7.23	1.04
14 Years	7.01	1.29
Control Group Initially Scoring High		
12 Years	7.85	0.87
13 Years	6.81	1.43
14 Years	6.71	1.26

Analysis of Variance	df	F	p
CIH12 v CIH13	1 & 16	4.50	.05
CIH13 v CIH14	1 & 16	0.54	N.S.
CIH12 v CIH14	1 & 16	6.31	.05
NIH12 v NIH13	1 & 16	6.30	.05
NIH13 v NIH14	1 & 16	0.29	N.S.
NIH12 v NIH14	1 & 16	11.25	.01
CIH12 v NIH12	1 & 32	0.19	N.S.
Covariance			
CIH13 v NIH13	1 & 31	0.83	N.S.
CIH14 v NIH14	1 & 31	0.37	N.S.

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.24

Cortertia - Initial Low Scorers

Comparison of Competitive and Control

Groups at 12, 13 and 14 Years

	Mean	SD
Competitive Group Initially Scoring Low		
12 Years	2.99	0.98
13 Years	5.22	1.32
14 Years	5.85	2.38
Control Group Initially Scoring Low		
12 Years	2.74	0.78
13 Years	4.20	1.42
14 Years	4.59	1.71

Analysis of Variance	df	F	p
CIL12 v CIL13	1 & 16	47.34	.01
CIL13 v CIL14	1 & 16	1.34	N.S.
CIL12 v CIL14	1 & 16	32.99	.01
NIL12 v NIL13	1 & 16	16.87	.01
NIL13 v NIL14	1 & 16	1.16	N.S.
NIL12 v NIL14	1 & 16	23.88	.01
CIL12 v NIL12	1 & 32	0.67	N.S.
Covariance			
CIL13 v NIL13	1 & 31	4.46	N.S.
CIL14 v NIL14	1 & 31	2.99	N.S.

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.25

Independence

Comparison of Competitive and Control Groups A, B and T at 12, 13 and 14 Years

	A		B		T	
	Mean	SD	Mean	SD	Mean	SD
Competitive Group						
12 Years	6.31	1.55	5.53	1.79	5.93	1.71
13 Years	6.33	2.13	5.99	1.60	6.16	1.89
14 Years	5.63	2.18	5.72	1.71	5.67	1.95
Control Group						
12 Years	6.66	1.66	6.32	1.74	6.49	1.69
13 Years	6.96	1.76	6.86	1.71	6.91	1.73
14 Years	7.07	2.11	6.82	1.98	6.95	2.04

Analysis of Variance	df	F	p	df	F	p	df	F	p
C12 v C13	1&53	0.00	NS	1&51	3.06	NS	1&105	1.67	NS
C13 v C14	1&53	9.16	.01	1&51	1.65	NS	1&105	8.46	.01
C12 v C14	1&53	6.16	.05	1&51	0.39	NS	1&105	2.04	NS
N12 v N13	1&53	0.95	NS	1&51	4.57	.05	1&105	4.94	.05
N13 v N14	1&53	0.26	NS	1&51	0.46	NS	1&105	2.00	NS
N12 v N14	1&53	1.41	NS	1&51	3.03	NS	1&105	4.87	.05
C12 v N12	1&106	1.31	NS	1&102	5.10	.05	1&210	5.25	.01
Covariance									
C13 v N13	1&105	2.69	NS	1&101	7.03	.01	1&209	8.24	.01
C14 v N14	1&105	12.59	.01	1&101	9.06	.01	1&209	21.28	.01

F ratios required for significance	df	.05	.01
	1&51	4.03	7.17
	1&53	4.02	7.14
	1&101 to 1& 106	3.94	6.90
	1&209 to 1&210	3.84	6.76

TABLE 5.26

Independence - Initial High Scorers

Comparison of Competitive and Control

Groups at 12, 13 and 14 Years

	Mean	SD
Competitive Group Initially Scoring High		
12 Years	8.45	0.61
13 Years	6.64	1.69
14 Years	5.98	1.83
Control Group Initially Scoring High		
12 Years	9.01	0.65
13 Years	7.95	1.63
14 Years	8.12	1.78

Analysis of Variance	df	F	p
CIH12 v CIH13	1 & 16	19.76	.01
CIH13 v CIH14	1 & 16	2.54	N.S.
CIH12 v CIH14	1 & 16	32.31	.01
NIH12 v NIH13	1 & 16	5.11	.05
NIH13 v NIH14	1 & 16	0.42	N.S.
NIH12 v NIH14	1 & 16	3.27	N.S.
CIH12 v NIH12	1 & 32	6.46	.05
Covariance			
CIH13 v NIH13	1 & 31	5.11	.05
CIH14 v NIH14	1 & 31	11.51	.01

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.27

Independence - Initial Low Scorers

Comparison of Competitive and Control

Groups at 12, 13 and 14 Years

	Mean	SD
Competitive Group Initially Scoring Low		
12 Years	3.34	0.68
13 Years	5.17	1.72
14 Years	4.42	2.06
Control Group Initially Scoring Low		
12 Years	3.98	0.54
13 Years	6.49	1.50
14 Years	6.83	1.74

Analysis of Variance	df	F	p
CIL12 v CIL13	1 & 16	29.99	.01
CIL13 v CIL14	1 & 16	2.72	N.S.
CIL12 v CIL14	1 & 16	5.63	.05
NIL12 v NIL13	1 & 16	46.89	.01
NIL13 v NIL14	1 & 16	1.54	N.S.
NIL12 v NIL14	1 & 16	41.08	.01
CIL12 v NIL12	1 & 32	9.06	.01
Covariance			
CIL13 v NIL13	1 & 31	5.35	.05
CIL14 v NIL14	1 & 31	13.29	.01

F ratios required for significance	df	.05	.01
	1 & 16	4.49	8.53
	1 & 32	4.15	7.50
	1 & 31	4.16	7.53

TABLE 5.28

Extraversion (J.E.P.I.)

Comparison of Competitive and Control Groups A, B and T at 12, 13 and 14 Years

	A		B		T	
	Mean	SD	Mean	SD	Mean	SD
Competitive Group						
12 Years	18.69	2.89	17.50	3.79	18.10	3.39
13 Years	19.24	3.03	18.67	4.00	18.96	3.34
14 Years	19.83	3.17	19.27	3.56	19.56	3.36
Control Group						
12 Years	18.17	3.04	16.88	3.58	17.53	3.36
13 Years	18.24	3.20	17.21	4.56	17.69	3.94
14 Years	18.52	4.12	17.71	4.27	18.00	4.24

Analysis of Variance	df	F	p	df	F	p	df	F	p
C12 v C13	1&53	1.92	NS	1&51	3.88	NS	1&105	5.61	.05
C13 v C14	1&53	2.20	NS	1&51	1.80	NS	1&105	4.52	.05
C12 v C14	1&53	8.05	.01	1&51	11.48	.01	1&105	19.47	.01
N12 v N13	1&53	0.02	NS	1&51	0.58	NS	1&105	0.48	NS
N13 v N14	1&53	0.43	NS	1&51	2.12	NS	1&105	2.19	NS
N12 v N14	1&53	0.32	NS	1&51	2.40	NS	1&105	2.43	NS
C12 v N12	1&106	0.83	NS	1&102	0.71	NS	1&210	1.47	NS
Covariance									
C13 v N13	1&105	3.40	NS	1&101	4.55	.05	1&209	5.97	.05
C14 v N14	1&105	3.42	NS	1&101	4.89	.05	1&209	8.34	.01

	df	.05	.01
F ratios required for significance	1&51	4.03	7.17
	1&53	4.02	7.14
	1&101 to 1&106	3.94	6.90
	1&209 to 1&210	3.89	6.76

TABLE 5.29

J.E.P.I. Extraversion - Comparison of Competitive and Control Groups Initially Scoring High on Extraversion and High on Neuroticism

	Mean	SD
Competitive Group Initially High Extraversion/ High Neuroticism		
12 Years	21.25	1.29
13 Years	20.08	2.84
14 Years	20.83	2.98
Control Group Initially High Extraversion/ High Neuroticism		
12 Years	21.14	1.07
13 Years	19.71	3.35
14 Years	20.00	2.94

Analysis of Variance	df	F	p
CHEHN12 v CHEHN13	1 & 11	4.39	N.S.
CHEHN13 v CHEHN14	1 & 11	3.20	N.S.
CHEHN12 v CHEHN14	1 & 11	0.60	N.S.
NHEHN12 v NHEHN13	1 & 6	1.52	N.S.
NHEHN13 v NHEHN14	1 & 6	0.13	N.S.
NHEHN12 v NHEHN14	1 & 6	0.87	N.S.

	df	.05	.01
F ratios required for significance	1 & 11	4.84	9.65
	1 & 6	5.99	13.74

TABLE 5.30

J.E.P.I. Extraversion - Comparison of Competitive and Control Groups Initially Scoring High on Extraversion and Low on Neuroticism

	Mean	SD
Competitive Group Initially High Extraversion/ Low Neuroticism		
12 Years	21.06	1.34
13 Years	21.29	2.08
14 Years	21.71	1.57
Control Group Initially High Extraversion/ Low Neuroticism		
12 Years	20.75	0.96
13 Years	18.42	3.09
14 Years	19.25	4.11

Analysis of Variance	df	F	p
CHELN12 v CHELN13	1 & 16	0.51	N.S.
CHELN13 v CHELN14	1 & 16	0.50	N.S.
CHELN12 v CHELN14	1 & 16	4.56	.05
NHELN12 v NHELN13	1 & 11	7.41	.05
NHELN13 v NHELN14	1 & 11	0.43	N.S.
NHELN12 v NHELN14	1 & 11	1.38	N.S.

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 11	4.84	9.65

TABLE 5.31

J.E.P.I. Extraversion - Comparison of Competitive and Control Groups Initially Scoring Low on Extraversion and High on Neuroticism

	Mean	SD
Competitive Group Initially Low Extraversion/ High Neuroticism		
12 Years	12.60	2.22
13 Years	14.80	3.91
14 Years	15.70	4.27
Control Group Initially Low Extraversion/ High Neuroticism		
12 Years	13.30	1.89
13 Years	14.80	3.05
14 Years	16.40	3.47

Analysis of Variance	df	F	p
CLEHN12 v CLEHN13	1 & 9	2.00	N.S.
CLEHN13 v CLEHN14	1 & 9	0.36	N.S.
CLEHN12 v CLEHN14	1 & 9	3.15	N.S.
NLEHN12 v NLEHN13	1 & 9	1.63	N.S.
NLEHN13 v NLEHN14	1 & 9	3.10	N.S.
NLEHN12 v NLEHN14	1 & 9	6.93	.05

	df	.05	.01
F ratios required for significance	1 & 9	5.12	10.56

TABLE 5.32

Neuroticism (J.E.P.I.)

Comparison of Competitive and Control Groups A, B and T at 12, 13 and 14 years

	A		B		T	
	Mean	SD	Mean	SD	Mean	SD
Competitive Group						
12 Years	11.65	5.09	12.29	4.57	11.96	4.83
13 Years	12.26	6.07	11.65	3.81	11.96	5.07
14 Years	11.26	6.27	11.40	4.50	11.36	5.48
Control Group						
12 Years	13.44	3.97	13.27	4.57	13.36	4.26
13 Years	14.61	5.58	13.02	5.02	13.82	5.34
14 Years	14.48	6.12	12.71	5.64	13.61	5.93

Analysis of Variance	df	F	p	df	F	p	df	F	p
C12 v C13	1&53	0.78	NS	1&51	1.21	NS	1&105	0.13	NS
C13 v C14	1&53	2.08	NS	1&51	0.47	NS	1&105	2.26	NS
C12 v C14	1&53	0.16	NS	1&51	2.44	NS	1&105	1.56	NS
N12 v N13	1&53	3.15	NS	1&51	0.15	NS	1&105	0.84	NS
N13 v N14	1&53	0.06	NS	1&51	0.53	NS	1&105	1.10	NS
N12 v N14	1&53	1.53	NS	1&51	0.50	NS	1&105	0.44	NS
C12 v N12	1&106	3.65	NS	1&102	1.12	NS	1&210	4.83	.05
Covariance									
C13 v N13	1&105	4.36	.05	1&101	2.38	NS	1&209	6.71	.05
C14 v N14	1&105	6.91	.01	1&101	1.66	NS	1&209	8.19	.01

	df	.05	.01
F ratios required for significance	1&51	4.03	7.17
	1&53	4.02	7.14
	1&101 to 1&106	3.94	6.90
	1&209 to 1&210	3.89	6.76

TABLE 5.33

J.E.P.I. Neuroticism - Comparison of Competitive and Control Groups Initially Scoring High on Neuroticism and High on Extraversion

	Mean	SD
Competitive Group Initially High Neuroticism/ High Extraversion		
12 Years	17.42	2.87
13 Years	15.92	5.11
14 Years	12.33	6.88
Control Group Initially High Neuroticism/ High Extraversion		
12 Years	17.57	1.13
13 Years	15.86	4.78
14 Years	16.00	6.95

Analysis of Variance	df	F	p
CHNHE12 v CHNHE13	1 & 11	1.38	N.S.
CHNHE13 v CHNHE14	1 & 11	11.39	.01
CHNHE12 v CHNHE14	1 & 11	7.84	.05
NHNHE12 v NHNHE13	1 & 6	0.89	N.S.
NHNHE13 v NHNHE14	1 & 6	0.04	N.S.
NHNHE12 v NHNHE14	1 & 6	0.36	N.S.

	df	.05	.01
F ratios required for significance	1 & 11	4.84	9.15
	1 & 6	5.99	13.74

TABLE 5.34

J.E.P.I. Neuroticism - Comparison of Competitive and Control Groups Initially Scoring High on Neuroticism and Low on Extraversion

	Mean	SD
Competitive Group Initially High Neuroticism/ Low Extraversion		
12 Years	17.20	1.23
13 Years	13.20	2.82
14 Years	14.80	4.08
Control Group Initially High Neuroticism/ Low Extraversion		
12 Years	18.10	1.66
13 Years	17.40	6.87
14 Years	13.50	7.59

Analysis of Variance	df	F	p
CHNLE12 v CHNLE13	1 & 9	18.46	.01
CHNLE13 v CHNLE14	1 & 9	1.21	N.S.
CHNLE12 v CHNLE14	1 & 9	4.38	N.S.
MHNLE12 v MHNLE13	1 & 9	0.12	N.S.
MHNLE13 v MHNLE14	1 & 9	0.65	N.S.
MHNLE12 v MHNLE14	1 & 9	0.50	N.S.

	df	.05	.01
F ratios required for significance	1 & 9	5.12	10.56

TABLE 5.35

J.E.P.I. Neuroticism - Comparison of Competitive and Control Groups Initially Scoring Low on Neuroticism and High on Extraversion

	Mean	SD
Competitive Group Initially Low Neuroticism/ High Extraversion		
12 Years	6.82	2.60
13 Years	8.47	4.24
14 Years	9.29	4.73
Control Group Initially Low Neuroticism/ High Extraversion		
12 Years	8.00	3.33
13 Years	11.25	4.94
14 Years	12.33	5.37

Analysis of Variance	df	F	p
CLNHE12 v CLNHE13	1 & 16	2.50	N.S.
CLNHE13 v CLNHE14	1 & 16	0.81	N.S.
CLNHE12 v CLNHE14	1 & 16	4.37	N.S.
NLNHE12 v NLNHE13	1 & 11	7.74	.05
NLNHE13 v NLNHE14	1 & 11	0.74	N.S.
NLNHE12 v NLNHE14	1 & 11	8.75	.05

	df	.05	.01
F ratios required for significance	1 & 16	4.49	8.53
	1 & 11	4.84	9.65

TABLE 5.36

Left Grip

Comparison of Competitive and Control Groups

A, B and T at 12, 13 and 14 Years

	A		B		T	
	Mean	SD	Mean	SD	Mean	SD
Competitive Group						
12 Years	52.9	16.6	58.6	13.9	55.7	15.6
13 Years	66.3	17.5	68.4	13.8	67.3	15.8
14 Years	82.3	16.9	81.9	13.9	82.1	15.5
Control Group						
12 Years	14.8	15.3	51.5	15.1	50.1	15.2
13 Years	67.3	17.5	62.5	15.6	64.9	15.7
14 Years	75.3	16.7	74.7	16.7	75.0	16.6

Analysis of Variance	df	F	p	df	F	p	df	F	p
C12 v C13	1&53	87.87	.01	1&51	47.74	.01	1&105	130.83	.01
C13 v C14	1&53	131.40	.01	1&51	114.82	.01	1&105	246.54	.01
C12 v C14	1&53	338.04	.01	1&51	189.35	.01	1&105	531.06	.01
N12 v N13	1&53	103.59	.01	1&51	37.74	.01	1&105	125.49	.01
N13 v N14	1&53	35.06	.01	1&51	71.50	.01	1&105	101.63	.01
N12 v N14	1&53	171.72	.01	1&51	143.62	.01	1&105	317.42	.01
C12 v N12	1&106	1.79	NS	1&102	6.22	.05	1&210	6.72	.05
Covariance									
C13 v N13	1&105	0.09	NS	1&101	4.02	.05	1&209	1.68	NS
C14 v N14	1&105	4.68	.05	1&101	5.67	.05	1&209	10.01	.01

	df	.05	.01
F ratios required for significance	1&51	4.03	7.17
	1&53	4.02	7.14
	1&101 to 1&106	3.94	6.90
	1&209 to 1& 210	3.89	6.76

TABLE 6.1

H.S.P.Q. Primary Factors, Means and Standard Deviations for Successful Competitive Group at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	10.31	3.35	10.94	4.14	12.34	3.83
B	6.60	1.65	6.86	1.26	7.40	1.65
C	9.43	3.06	10.03	3.82	9.86	3.17
D	11.91	3.01	11.29	3.79	10.11	3.56
E	10.17	3.47	10.60	2.57	11.83	3.02
F	11.11	3.09	11.83	3.53	11.94	3.53
G	10.42	2.79	11.26	3.22	11.57	2.85
H	10.17	2.85	9.83	3.53	11.74	3.96
I	6.34	3.44	5.51	2.87	5.63	3.54
J	7.60	3.08	7.45	3.21	7.86	3.41
O	10.86	2.77	10.00	3.27	9.66	2.29
Q_2	10.51	3.15	10.37	2.93	9.74	2.70
Q_3	11.69	2.78	11.03	2.63	11.17	2.91
Q_4	9.06	2.89	9.00	3.54	8.74	3.12

TABLE 6.2

H.S.P.Q. Primary Factors, Means and Standard Deviations for Unsuccessful Competitive Group at 12, 13 and 14 Years

	12 Years		13 Years		14 Years	
Factor	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	10.00	3.41	11.57	3.79	12.00	4.21
B	6.69	1.66	7.11	1.51	7.17	1.36
C	10.34	3.13	11.37	3.46	11.94	3.73
D	10.74	3.72	10.31	3.82	8.80	3.50
E	9.34	3.70	11.37	3.38	11.91	3.40
F	10.49	3.37	11.66	3.47	12.03	3.19
G	10.40	3.16	10.49	3.85	10.71	3.95
H	11.06	3.46	12.11	4.00	12.03	4.28
I	7.31	2.82	6.31	2.97	5.89	3.18
J	8.86	3.47	7.83	3.49	6.40	3.11
O	10.54	2.55	10.37	3.34	8.71	3.28
Q_2	10.80	2.58	10.74	3.53	9.51	3.55
Q_3	11.60	2.72	11.46	2.80	10.66	2.87
Q_4	8.26	3.35	8.71	3.85	7.97	3.86

TABLE 6.3

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Successful Competitive Group

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.1267	0.3575	0.5092
df	14	14	14
Chi Square	7.44	18.05	25.62
p	N.S.	N.S.	.05
Wilks Lambda	0.8875	0.7477	0.6026
df	14 & 55	14 & 55	14 & 55
F	0.50	1.35	2.00
p	N.S.	N.S.	.05
Scaled Vectors			
A	1.60	8.51	4.40
B	-0.58	7.42	9.08
C	4.67	-10.50	-5.12
D	-8.81	-7.26	-10.24
E	4.63	-7.37	0.01
F	4.55	-6.72	3.48
G	4.94	0.21	6.25
H	-13.79	9.42	1.37
I	-7.92	3.27	1.02
J	2.65	5.71	5.65
O	-11.59	-3.00	-5.73
Q_2	6.46	0.74	-0.01
Q_3	-0.56	-4.19	-4.27
Q_4	4.93	2.82	5.79

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 55	1.90	2.47

TABLE 6.4

M.S.P.C. Total Personality Profile, Multiple Discriminant Analyses of Unsuccessful Competitive Group

	12 v 13	13 v 14	12 v 14
Eigenvalue	0.2067	0.4578	0.5652
df	14	14	14
Chi Square	14.38	23.37	27.77
p	N.S.	N.S.	.05
Wilks Lambda	0.7932	0.6860	0.6389
df	14 & 55	14 & 55	14 & 55
F	1.08	1.80	2.22
p	N.S.	N.S.	.05
Scaled Vectors			
A	10.22	-8.26	0.77
B	2.01	3.62	5.86
C	7.93	-5.41	-1.57
D	-0.58	-10.53	-10.61
E	11.09	-6.46	5.69
F	4.78	-4.27	-1.91
G	-2.55	5.80	6.06
H	11.27	-15.08	-13.70
I	-5.12	1.35	-0.91
J	4.87	-13.11	-10.74
C	14.33	-9.74	-9.23
C_2	3.61	-3.17	-1.52
C_3	-0.67	-5.48	-3.12
C_4	4.29	-3.16	2.27

Values required for significance	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 55	1.90	2.47

TABLE 6.5

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Successful and Unsuccessful Competitive Groups

	12 years	13 years	14 years
Eigenvalue	0.2257	0.5661	0.4979
df	14	14	14
Chi Square	13.03	27.81	25.07
p	N.S.	.05	.05
Wilks Lambda	0.8158	0.6385	0.6676
df	14 & 55	14 & 55	14 & 55
F	0.89	2.22	1.96
p	N.S.	.05	.05
Scaled Vectors			
A	-2.63	0.31	-16.34
B	2.40	5.69	-1.50
C	3.75	5.86	15.74
D	-3.98	-5.24	-5.97
E	-4.07	8.32	1.93
F	-2.35	-4.78	0.54
G	-2.52	-6.16	-10.22
H	15.34	13.43	-5.90
I	5.37	5.46	4.22
J	11.99	7.41	-8.92
O	3.57	11.10	-6.75
Q_2	0.72	1.92	-1.26
Q_3	-10.10	2.98	2.17
Q_4	-7.04	2.24	-2.02

Values required for significance

	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 55	1.90	2.47

TABLE 6.6

Exvia

Comparison of Successful Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Mean	SD
Successful Competitive Group		
12 Years	5.93	2.17
13 Years	6.48	2.71
14 Years	7.42	2.79
Unsuccessful Competitive Group		
12 Years	5.56	2.28
13 Years	7.04	2.50
14 Years	7.68	2.85

Analysis of Variance	df	F	p
SC12 v SC13	1 & 34	1.82	N.S.
SC13 v SC14	1 & 34	6.48	.05
SC12 v SC14	1 & 34	12.64	.01
UC12 v UC13	1 & 34	16.02	.01
UC13 v UC14	1 & 34	2.44	N.S.
UC12 v UC14	1 & 34	14.81	.01
SC12 v UC12 Covariance	1 & 68	0.54	N.S.
SC13 v UC13	1 & 67	0.79	N.S.
SC14 v UC14	1 & 67	0.15	N.S.

	df	.05	.01
F ratios required for significance	1 & 34	4.13	7.45
	1 & 67 to 1 & 68	3.99	7.03

TABLE 6.7

Anxiety

Comparison of Successful Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Mean	SD
Successful Competitive Group		
12 Years	5.45	1.63
13 Years	5.25	2.04
14 Years	4.85	2.01
Unsuccessful Competitive Group		
12 Years	5.00	2.13
13 Years	4.81	2.09
14 Years	4.50	2.12

Analysis of Variance	df	F	p
SC12 v SC13	1 & 34	0.49	N.S.
SC13 v SC14	1 & 34	3.59	N.S.
SC12 v SC14	1 & 34	2.60	N.S.
UC12 v UC13	1 & 34	0.44	N.S.
UC13 v UC14	1 & 34	1.63	N.S.
UC12 v UC14	1 & 34	2.16	N.S.
SC12 v UC12 Covariance	1 & 68	0.95	N.S.
SC13 v UC13	1 & 67	0.76	N.S.
SC14 v UC14	1 & 67	0.45	N.S.

	df	.05	.01
F ratios required for significance	1 & 34	4.13	7.45
	1 & 67 to 1 & 68	3.99	7.03

TABLE 6.8

Cortertia

Comparison of Successful Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Mean	SD
Successful Competitive Group		
12 Years	5.38	1.40
13 Years	5.79	1.51
14 Years	5.87	1.50
Unsuccessful Competitive Group		
12 Years	5.41	1.66
13 Years	6.11	1.53
14 Years	6.57	1.93

Analysis of Variance	df	F	p
SC12 v SC13	1 & 34	2.18	N.S.
SC13 v SC14	1 & 34	0.55	N.S.
SC12 v SC14	1 & 34	3.63	N.S.
UC12 v UC13	1 & 34	7.79	.01
UC13 v UC14	1 & 34	2.71	N.S.
UC12 v UC14	1 & 34	9.81	.01
SC12 v UC12	1 & 68	0.01	N.S.
Covariance			
SC13 v UC13	1 & 67	1.17	N.S.
SC14 v UC14	1 & 67	2.76	N.S.

	df	.05	.01
F ratios required for significance	1 & 34	4.13	7.45
	1 & 67 to 1 & 68	3.99	7.03

TABLE 6.9

Independence

Comparison of Successfull Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Mean	SD
Successful Competitive Group		
12 Years	6.30	1.84
13 Years	6.01	1.65
14 Years	5.85	1.79
Unsuccessful Competitive Group		
12 Years	6.07	1.72
13 Years	6.23	2.32
14 Years	5.19	2.15

Analysis of Variance	df	F	p
SC12 v SC13	1 & 34	0.68	N.S.
SC13 v SC14	1 & 34	0.57	N.S.
SC12 v SC14	1 & 34	1.37	N.S.
UC12 v UC13	1 & 34	0.39	N.S.
UC13 v UC14	1 & 34	11.46	.01
UC12 v UC14	1 & 34	7.17	.05
SC12 v UC12	1 & 68	0.27	N.S.
Covariance			
SC13 v UC13	1 & 67	0.16	N.S.
SC14 v UC14	1 & 67	1.86	N.S.

	df	.05	.01
F ratios required for significance	1 & 34	4.13	7.45
	1 & 67 to 1 & 68	3.99	7.03

TABLE 6.10

Extraversion (J.E.P.I.)

Comparison of Successful Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Mean	SD
Successful Competitive Group		
12 Years	18.60	3.04
13 Years	19.26	3.04
14 Years	19.09	3.41
Unsuccessful Competitive Group		
12 Years	17.97	3.49
13 Years	19.51	3.19
14 Years	20.17	3.02

Analysis of Variance	df	F	p
SC12 v SC13	1 & 34	1.76	N.S.
SC13 v SC14	1 & 34	0.53	N.S.
SC12 v SC14	1 & 34	1.42	N.S.
UC12 v UC13	1 & 34	5.35	.05
UC13 v UC14	1 & 34	1.91	N.S.
UC12 v UC14	1 & 34	10.87	.01
SC12 v UC12	1 & 68	0.61	N.S.
Covariance			
SC13 v UC13	1 & 67	0.09	N.S.
SC14 v UC14	1 & 67	1.89	N.S.

	df	.05	.01
F ratios required for significance	1 & 34	4.13	7.45
	1 & 67 to 1 & 68	3.99	7.03

TABLE 6.11

Neuroticism (J.E.P.I.)

Comparison of Successful Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Mean	SD
Successful Competitive Group		
12 Years	12.03	4.67
13 Years	12.23	5.43
14 Years	11.89	5.96
Unsuccessful Competitive Group		
12 Years	12.17	4.97
13 Years	10.46	4.67
14 Years	10.09	5.47

Analysis of Variance	df	F	p
SC12 v SC13	1 & 34	0.19	N.S.
SC13 v SC14	1 & 34	0.24	N.S.
SC12 v SC14	1 & 34	0.05	N.S.
UC12 v UC13	1 & 34	6.13	.05
UC13 v UC14	1 & 34	0.39	N.S.
UC12 v UC14	1 & 34	5.41	.05
SC12 v UC12 Covariance	1 & 68	0.00	N.S.
SC13 v UC13	1 & 67	2.09	N.S.
SC14 v UC14	1 & 67	1.69	N.S.

	df	.05	.01
F ratios required for significance	1 & 34	4.13	7.45
	1 & 67 to 1 & 68	3.99	7.03

TABLE 6.12

Left Grip

Comparison of Successful Competitive and Unsuccessful Competitive Groups at 12, 13 and 14 Years

	Mean	SD
Successful Competitive Group		
12 Years	58.7	16.4
13 Years	69.5	16.9
14 Years	85.7	15.1
Unsuccessful Competitive Group		
12 Years	51.1	14.3
13 Years	62.5	14.9
14 Years	76.9	13.6

Analysis of Variance	df	F	p
SC12 v SC13	1 & 34	49.33	.01
SC13 v SC14	1 & 34	82.22	.01
SC12 v SC14	1 & 34	198.92	.01
UC12 v UC13	1 & 34	23.23	.01
UC13 v UC14	1 & 34	104.34	.01
UC12 v UC14	1 & 34	162.39	.01
SC12 v UC12 Covariance	1 & 68	4.42	.05
SC13 v UC13	1 & 67	3.29	N.S.
SC14 v UC14	1 & 67	6.47	.05

	df	.05	.01
F ratios required for significance	1 & 34	4.13	7.45
	1 & 67 to 1 & 68	3.99	7.03

TABLE 7.1

H.S.P.Q. Primary Factors, Means and Standard Deviations for Drop Out Group at 12 Years

Factor	Mean	SD	Factor	Mean	SD	Factor	Mean	SD
A	9.96	4.40	F	11.46	3.79	Q	10.35	3.49
B	6.27	1.61	G	10.12	2.93	Q_2	10.15	2.82
C	10.12	3.54	H	10.65	2.73	Q_3	10.92	2.88
D	10.65	3.67	I	7.27	2.91	Q_4	8.58	2.86
E	9.73	3.04	J	7.58	3.53			

TABLE 7.2

H.S.P.Q. Total Personality Profile, Multiple Discriminant Analyses of Successful and Unsuccessful Competitive Groups and Drop Out Group at 12 Years

	SC12 v Drop 12	UC12 v Drop 12
Eigenvalue	0.1783	0.1159
df	14	14
Chi Square	8.69	5.81
p	N.S.	N.S.
Wilks Lambda	0.8487	0.8962
df	14 & 46	14 & 46
F	0.59	0.38
p	N.S.	N.S.
Scaled Vectors		
A	-8.93	-8.07
B	-2.74	-7.18
C	2.28	-2.16
D	-12.65	-2.73
E	-5.07	-0.44
F	7.27	7.08
G	-4.26	-4.13
H	4.98	4.85
I	7.35	0.76
J	3.16	-16.34
Q	0.00	-3.80
Q_2	-2.46	-2.96
Q_3	-10.14	-3.22
Q_4	5.47	1.57

Values required for significance	df	.05	.01
Chi Square	14	23.69	29.14
F	14 & 46	1.92	2.53

TABLE 7.3

Envia

Comparison of Successful Competitive and Drop-Out Groups at 12 Years

		Mean	SD
Successful Competitive Group		5.93	2.17
Drop-Out Group		6.08	2.72
Analysis of Variance	df	F	p
SC12 v Drop 12	1 & 59	0.02	N.S.

TABLE 7.4

Envia

Comparison of Unsuccessful Competitive and Drop-Out Groups A & B at 12 Years

		Mean	SD
Unsuccessful Competitive Group		5.56	2.28
Drop-Out Group		6.08	2.72
Analysis of Variance	df	F	p
UC12 v Drop 12	1 & 59	1.42	N.S.

	df	.05	.01
F ratio required for significance	1 & 59	4.00	7.08

TABLE 7.5

Anxiety

Comparison of Successful Competitive and Drop-Out Groups at 12 Years

		Mean	SD
Successful Competitive Group		5.45	1.63
Drop-Out Group		5.17	1.71
Analysis of Variance	df	F	p
SCl2 v Drop 12	1 & 59	0.39	N.S.

TABLE 7.6

Anxiety

Comparison of Unsuccessful Competitive and Drop-Out Groups A & B at 12 Years

		Mean	SD
Unsuccessful Competitive Group		5.00	2.13
Drop-Out Group		5.17	1.71
Analysis of Variance	df	F	p
UCl2 v Drop 12	1 & 59	0.05	N.S.

	df	.05	.01
F ratio required for significance	1 & 59	4.00	7.08

TABLE 7.7

Cortertia

Comparison of Successful Competitive and Drop-Out Groups at 12 Years

		Mean	SD
Successful Competitive Group		5.38	1.40
Drop-Out Group		5.78	1.55
Analysis of Variance	df	F	p
SC12 v Drop 12	1 & 59	1.03	N.S.

TABLE 7.8

Cortertia

Comparison of Unsuccessful Competitive and Drop-Out Groups A & B at 12 Years

		Mean	SD
Unsuccessful Competitive Group		5.41	1.66
Drop-Out Group		5.78	1.55
Analysis of Variance	df	F	p
UC12 v Drop 12	1 & 59	0.68	N.S.

	df	.05	.01
F ratios required for significance	1 & 59	4.00	9.08

TABLE 7.9

Independence

Comparison of Successful Competitive and Drop-Out Groups at 12 Years

		Mean	SD
Successful Competitive Group		6.30	1.84
Drop-Out Group		5.77	2.06
Analysis of Variance	df	F	p
SC12 v Drop 12	1 & 59	1.12	N.S.

TABLE 7.10

Independence

Comparison of Unsuccessful Competitive and Drop-Out Groups A & B at 12 Years

		Mean	SD
Unsuccessful Competitive Group		6.07	1.72
Drop-Out Group		5.77	2.06
Analysis of Variance	df	F	p
UC12 v Drop 12	1 & 59	0.19	N.S.

	df	.05	.01
F ratios required for significance	1 & 59	4.00	7.08

TABLE 7.11

Extraversion (J.E.P.I.)

Comparison of Successful Competitive and Drop-Out Groups at 12 Years

		Mean	SD
Successful Competitive Group		18.60	3.04
Drop-Out Group		18.12	2.70
Analysis of Variance	df	F	p
SC12 v Drop 12	1 & 59	0.39	N.S.

TABLE 7.12

Extraversion (J.E.P.I.)

Comparison of Unsuccessful Competitive and Drop-Out Groups A & B at 12 Years

		Mean	SD
Unsuccessful Competitive Group		17.97	3.49
Drop-Out Group		18.12	2.70
Analysis of Variance	df	F	p
UC12 v Drop 12	1 & 59	0.01	N.S.

	df	.05	.01
F ratio required for significance	1 & 59	4.00	7.08

TABLE 7.13

Neuroticism

Comparison of Successful Competitive and Drop-Out Groups at 12 Years

		Mean	SD
Successful Competitive Group		12.03	4.67
Drop-Out Group		12.04	5.12
Analysis of Variance	df	F	p
SC12 v Drop 12	1 & 59	0.02	N.S.

TABLE 7.14

Neuroticism

Comparison of Unsuccessful Competitive and Drop-Out Groups A & B at 12 Years

		Mean	SD
Unsuccessful Competitive Group		12.17	4.97
Drop-Out Group		12.04	5.12
Analysis of Variance	df	F	p
UC12 v Drop 12	1 & 59	0.00	N.S.

	df	.05	.01
F ratio required for significance	1 & 59	4.00	7.08

TABLE 7.15

Left Grip

Comparison of Successful Competitive and Drop-Out Groups at 12 Years

		Mean	SD
Successful Competitive Group		58.7	16.4
Drop-Out Group		54.2	13.2
Analysis of Variance	df	F	p
SC12 v Drop 12	1 & 59	1.31	N.S.

TABLE 7.16

Left Grip

Comparison of Unsuccessful Competitive and Drop-Out Groups A & B at 12 Years

		Mean	SD
Unsuccessful Competitive Group		51.1	14.3
Drop-Out Group		54.2	13.2
Analysis of Variance	df	F	p
UC12 v Drop 12	1 & 59	0.82	N.S.

	df	.05	.01
F ratio required for significance	1 & 59	4.00	7.08

TABLE 8.1

Raw Scores HSPQ Primary Factors

Competitive Group A 12 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
C1	13	7	10	12	9	13	11	13	9	12	9	11	14	7
C2	11	9	8	8	8	5	10	9	6	15	14	11	13	10
C3	8	8	8	8	16	17	12	8	8	8	12	14	8	10
C4	6	7	9	11	7	8	15	7	9	10	13	11	10	11
C5	11	6	11	13	9	14	12	13	11	1	7	16	12	11
C6	9	6	12	11	9	12	12	15	9	8	10	16	12	8
C9	10	9	9	9	10	9	9	11	10	7	11	5	9	11
C10	12	7	10	19	8	12	5	3	10	10	12	14	8	10
C11	13	7	7	12	13	11	6	8	7	11	18	8	11	10
C12	10	8	10	12	7	12	13	10	8	7	13	10	9	8
C13	10	8	10	14	4	6	15	14	3	7	9	10	13	10
C14	10	8	12	10	17	10	10	11	5	6	8	13	13	10
C15	7	3	8	15	10	10	10	13	6	13	7	16	10	11
C17	8	7	8	14	10	12	8	7	11	10	11	7	8	11
C18	8	6	5	14	12	7	9	6	10	4	14	10	11	11
C20	12	6	10	11	7	15	6	12	4	7	14	8	6	12
C21	10	7	9	7	14	11	10	12	7	8	9	10	9	10
C25	3	4	7	13	10	5	12	9	10	12	14	14	15	2
C26	11	7	11	11	7	11	14	10	7	11	11	12	11	6
C27	10	7	9	15	11	11	4	10	10	12	9	8	11	11
C28	10	5	10	10	4	10	10	10	8	6	10	16	8	14
C29	12	7	14	13	17	15	12	11	8	9	8	16	15	4
C30	12	7	13	13	13	15	6	12	5	6	6	10	6	6
C31	6	7	4	11	10	12	7	14	10	6	14	10	12	6
C33	12	8	13	7	13	13	15	16	5	12	9	12	15	11
C34	8	7	12	9	12	14	7	12	5	9	10	13	15	9
C35	9	4	11	8	5	8	9	10	9	7	12	11	10	7
C36	12	3	12	10	10	12	10	12	8	10	12	6	8	8
C37	9	6	15	10	6	15	9	11	10	10	10	13	11	6
C38	13	5	10	14	11	10	12	14	5	9	10	10	13	12
C39	12	7	12	10	4	11	10	10	8	10	13	15	15	6
C42	13	8	15	10	10	13	7	15	4	6	8	7	12	7
C43	14	8	4	14	12	15	8	10	3	4	11	11	7	7
C45	12	7	11	6	4	5	19	17	7	10	9	18	15	4
C46	16	8	15	2	8	6	12	18	6	2	7	10	16	1
C47	10	8	13	13	18	12	10	13	11	4	8	11	13	9
C49	7	4	6	7	11	11	14	12	8	9	9	12	9	10
C51	7	3	10	16	10	3	10	8	5	8	11	8	8	10
C52	10	4	15	8	11	16	13	15	4	4	10	10	15	3
C54	8	6	8	15	11	8	9	7	9	13	8	15	12	12
C55	11	6	11	6	5	7	15	14	15	5	11	11	17	7
C56	11	6	9	17	9	13	14	14	4	7	15	7	16	11
C59	13	6	9	11	15	12	8	10	4	6	10	10	9	9
C60	12	6	10	12	10	18	16	10	8	2	10	8	12	10
C61	7	8	9	8	12	19	11	6	11	11	13	11	10	10
C62	18	9	11	14	12	16	12	10	8	5	10	7	10	7
C63	12	5	10	11	10	18	12	10	4	8	14	7	10	6
C65	10	7	8	14	10	9	14	5	10	6	15	10	10	10
C66	10	6	8	12	13	13	8	17	0	8	12	12	17	12
C67	7	10	13	11	11	9	3	5	7	13	12	13	10	11
C68	12	7	14	8	12	8	13	14	9	7	10	13	10	10
C69	6	7	7	10	15	6	13	5	6	10	11	9	10	11
C71	7	9	12	12	11	5	10	9	12	12	11	10	13	9
C72	9	6	12	7	12	9	12	15	6	4	8	10	13	8

TABLE 8.2

Raw Scores 16PF Primary Factors

Competitive Group B 12 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
C75	13	9	10	6	11	16	15	16	6	9	8	10	11	4
C76	8	3	8	16	8	12	10	8	10	4	10	8	12	8
C78	7	8	10	13	10	12	4	10	5	14	10	10	8	13
C79	7	5	5	13	12	14	12	7	4	8	12	13	14	10
C80	4	7	4	14	9	9	7	6	11	14	11	18	8	12
C81	8	5	13	11	13	11	13	8	6	8	10	10	13	7
C82	12	5	7	8	8	7	12	12	5	8	9	12	14	10
C83	14	4	17	12	7	11	9	9	13	11	9	8	8	11
C85	19	4	6	6	12	17	8	11	5	2	5	7	13	11
C88	9	3	10	12	11	9	9	13	3	12	11	10	8	13
C90	13	7	6	14	9	12	8	11	10	10	12	8	11	4
C91	4	7	7	16	6	8	10	9	5	9	15	8	10	10
C92	3	7	9	16	9	6	9	9	5	13	15	13	17	9
C93	9	5	7	13	12	10	10	9	5	6	10	7	12	10
C94	11	8	4	17	7	12	9	7	5	6	14	8	9	12
C95	12	5	5	8	5	11	11	10	8	5	12	10	14	5
C97	10	7	12	7	16	17	9	13	7	8	8	11	9	4
C98	16	8	15	9	10	12	12	15	4	6	8	8	14	6
C99	10	8	10	11	4	4	14	4	12	9	11	11	16	3
C101	8	7	11	11	11	12	9	11	8	6	7	6	9	8
C103	16	8	9	17	11	15	11	8	4	5	10	10	10	11
C104	7	5	7	15	18	10	11	10	9	5	15	9	10	13
C105	12	6	11	9	13	10	9	12	2	5	7	11	9	6
C106	7	8	15	13	7	15	13	9	9	9	9	11	14	7
C107	16	5	11	11	12	9	9	12	7	3	11	12	14	7
C108	14	6	6	8	6	6	14	8	6	8	12	8	12	10
C109	6	3	12	10	6	12	14	2	6	14	10	12	12	8
C110	13	8	14	14	14	14	15	18	10	2	8	14	10	6
C111	4	9	8	10	8	13	13	13	2	4	16	10	7	7
C112	9	8	8	12	8	9	8	11	8	5	13	12	11	10
C113	15	6	8	6	9	9	4	9	0	6	13	15	14	10
C115	17	5	10	8	9	14	9	9	8	8	7	6	9	5
C117	7	9	6	18	9	10	12	9	2	11	13	11	8	14
C118	17	8	14	9	7	11	11	13	3	4	8	7	7	9
C119	13	8	8	7	9	10	8	12	9	8	11	8	9	8
C120	11	8	9	12	8	9	8	8	6	6	9	8	15	8
C121	8	9	14	6	4	4	15	10	8	10	4	10	14	2
C122	9	6	11	14	2	6	8	8	10	6	12	8	10	8
C123	11	4	5	15	13	13	7	10	8	5	14	9	10	11
C124	5	9	15	14	4	13	12	15	4	2	4	10	13	12
C125	9	6	10	10	6	13	14	14	3	3	11	10	12	5
C126	14	6	10	7	7	11	14	16	4	10	6	8	17	3
C127	12	9	12	10	8	11	9	8	3	6	9	10	13	3
C128	3	7	7	10	8	10	8	10	8	17	7	13	13	11
C130	10	8	11	12	6	4	15	5	6	5	11	10	8	8
C131	8	8	8	13	8	15	10	13	15	7	12	7	8	9
C132	7	6	14	8	16	10	13	14	1	9	4	10	15	10
C133	16	8	12	7	12	7	8	7	8	6	11	11	12	3
C135	13	6	10	12	9	11	9	8	13	11	14	15	11	12
C136	11	7	15	10	5	7	9	10	8	8	6	8	11	11
C139	6	8	9	12	6	11	12	11	5	9	13	10	10	11
C140	10	8	6	8	8	11	13	12	3	12	8	8	12	8

TABLE 8.3

Raw Scores HSPQ Primary Factors

Competitive Group A 13 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
C1	18	5	15	11	14	12	9	16	5	6	5	8	13	5
C2	8	6	5	13	8	8	10	9	11	14	13	13	13	9
C3	8	8	11	12	8	17	8	12	4	10	13	15	10	9
C4	7	6	6	12	8	7	12	2	7	8	11	12	11	10
C5	14	6	9	5	14	15	12	10	4	2	9	8	9	5
C6	10	5	10	11	10	9	12	9	5	8	13	11	11	10
C9	20	8	13	1	16	16	10	15	9	6	6	6	10	9
C10	14	6	8	12	12	12	9	3	8	6	18	16	8	16
C11	11	5	9	15	6	5	10	3	9	12	10	12	13	12
C12	13	9	5	15	14	14	7	7	9	8	13	10	17	8
C13	17	8	10	15	5	14	8	9	5	6	16	13	12	13
C14	8	8	12	10	15	12	10	9	9	6	6	13	10	7
C15	8	7	8	10	12	9	6	12	0	8	10	10	11	12
C17	15	8	8	10	11	10	9	7	4	8	6	8	7	8
C18	6	8	6	12	12	8	10	8	8	7	11	11	12	12
C20	10	6	10	12	9	13	10	14	6	6	11	9	9	11
C21	8	7	11	12	10	12	10	11	8	7	14	10	10	8
C25	10	5	12	11	12	14	18	20	8	4	12	14	12	2
C26	11	8	12	12	9	10	13	9	6	8	14	14	14	10
C27	7	6	9	15	11	5	5	14	9	6	12	10	13	9
C28	6	8	8	15	8	12	11	6	4	7	11	8	12	8
C29	16	7	16	9	13	16	12	14	2	11	13	12	14	6
C30	11	9	13	12	14	14	10	12	6	7	10	10	6	8
C31	8	9	7	17	4	13	10	12	11	8	14	7	12	10
C33	8	9	5	18	12	7	12	10	8	12	13	13	14	10
C34	13	9	8	5	8	15	6	13	2	10	11	7	12	15
C35	9	6	7	10	9	16	11	14	10	6	10	8	10	7
C36	4	4	8	12	11	10	10	11	8	12	8	12	12	11
C37	10	7	13	8	16	17	8	10	7	10	10	11	11	6
C38	17	7	12	9	13	10	8	16	5	8	8	9	12	4
C39	14	8	14	10	9	8	10	15	9	7	10	10	15	11
C42	6	6	10	14	11	15	5	10	7	4	13	12	6	8
C43	9	8	3	18	10	10	12	4	8	12	12	15	7	12
C45	16	7	14	6	6	4	19	17	4	9	8	19	16	2
C46	18	9	16	3	7	10	18	18	10	7	8	7	14	6
C47	14	8	14	11	12	14	12	12	9	8	5	9	12	10
C49	14	7	6	13	16	12	6	6	6	10	9	14	10	10
C51	9	7	14	15	11	7	5	5	4	6	18	10	18	12
C52	12	9	15	5	10	16	12	12	1	3	4	6	13	6
C54	4	8	9	15	9	9	8	9	7	11	10	15	10	12
C55	11	5	14	7	7	8	12	17	9	6	7	11	15	5
C56	12	7	12	12	16	14	17	11	6	4	7	7	11	11
C59	16	8	5	15	15	14	5	8	5	7	13	9	8	12
C60	8	9	9	14	10	14	13	4	6	14	8	12	12	8
C61	10	8	9	7	10	18	11	10	9	7	11	8	12	11
C62	18	7	12	13	9	14	14	13	3	7	7	8	12	8
C63	16	6	17	3	12	14	16	16	0	2	4	4	16	2
C65	13	6	13	4	12	13	13	9	2	5	4	11	15	4
C66	14	7	16	7	13	19	12	14	3	5	10	6	8	7
C67	6	7	9	15	11	11	6	9	7	12	12	15	9	10
C68	8	7	12	14	14	15	13	9	7	10	14	10	10	16
C69	10	7	6	16	12	15	8	5	9	10	14	8	6	10
C71	9	8	7	17	16	8	12	10	8	10	12	11	11	14
C72	8	4	17	6	6	11	14	9	2	6	12	10	17	4

TABLE 8.4

Raw Scores HSPQ Primary Factors

Competitive Group B 13 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
C75	12	8	7	12	10	17	8	12	8	10	11	5	10	8
C76	12	5	10	12	10	15	9	13	8	8	9	10	10	10
C78	7	7	15	11	6	11	9	10	11	15	11	8	11	9
C79	18	6	6	12	12	18	7	9	4	8	16	10	10	10
C80	6	7	3	7	7	9	10	7	10	10	13	15	12	6
C81	10	6	9	11	12	8	10	11	6	5	12	9	10	6
C82	12	5	8	7	7	9	12	13	5	7	9	13	13	9
C83	9	7	12	10	15	14	8	13	6	6	9	10	10	11
C85	15	8	15	8	9	15	8	12	4	5	8	6	15	10
C88	8	4	14	11	15	13	8	15	11	4	7	11	8	10
C90	12	3	12	8	12	6	8	8	8	12	10	10	8	4
C91	4	9	9	12	8	5	6	8	0	10	16	16	12	13
C92	6	6	4	8	12	9	10	8	2	8	12	10	14	6
C93	10	7	11	13	11	9	13	10	8	8	10	12	9	10
C94	10	8	4	17	8	11	7	10	6	7	16	12	8	13
C95	12	9	12	6	9	18	16	16	4	11	9	7	9	5
C97	10	8	13	13	17	11	11	11	2	4	7	12	14	7
C98	18	9	19	3	10	10	18	18	4	4	2	6	16	3
C99	9	6	11	7	7	8	16	11	16	14	9	15	14	4
C101	13	7	14	11	14	16	12	13	6	6	9	10	6	2
C103	16	8	14	12	16	11	7	14	6	2	10	16	9	8
C104	16	6	14	8	16	11	11	16	2	2	9	6	8	4
C105	10	6	7	8	12	12	13	11	2	11	8	17	12	6
C106	6	7	11	12	8	11	14	12	6	12	6	12	12	10
C107	11	7	14	13	11	10	11	9	7	6	12	7	12	4
C108	12	8	4	15	12	10	9	8	2	4	14	6	10	14
C109	14	6	16	8	12	8	14	14	4	8	6	14	13	8
C110	14	8	17	10	12	12	13	13	8	0	4	7	16	6
C111	14	7	8	8	14	11	8	9	7	10	12	11	10	6
C112	6	7	4	15	9	11	12	6	12	11	13	9	12	12
C113	8	7	10	5	12	9	18	13	6	4	6	11	16	6
C115	13	6	10	10	13	11	13	12	6	1	13	13	11	5
C117	12	7	13	10	9	15	12	12	2	6	11	14	10	16
C118	17	7	6	8	13	16	8	16	10	3	8	10	10	10
C119	11	5	11	14	10	14	5	7	4	1	13	15	6	13
C120	13	7	9	9	13	13	12	9	1	7	11	13	15	9
C121	6	8	14	8	12	8	17	12	12	8	4	12	12	8
C122	10	8	10	15	13	12	8	11	5	8	14	10	14	10
C123	7	8	5	6	9	11	12	7	3	5	14	12	10	12
C124	13	8	11	17	10	13	10	10	8	8	6	7	9	13
C125	13	6	16	9	9	15	10	12	2	6	10	8	18	4
C126	13	9	8	13	9	14	16	14	4	8	11	7	8	9
C127	13	10	9	9	7	13	13	9	4	14	10	8	13	4
C128	7	6	10	14	7	7	7	5	8	14	11	17	10	12
C130	7	6	10	10	14	12	18	9	5	10	11	11	8	9
C131	8	8	11	13	10	13	9	11	9	11	14	10	13	9
C132	11	4	11	11	13	11	6	11	2	10	7	11	12	11
C133	20	5	13	7	6	6	11	10	1	10	8	11	15	9
C135	11	6	12	15	9	11	13	4	9	9	17	7	9	16
C136	7	6	10	15	5	12	9	10	12	7	6	12	13	11
C139	10	7	11	16	11	14	14	9	4	12	8	16	10	12
C140	14	7	10	12	10	10	8	8	6	0	12	12	12	14

TABLE 8.5

Raw Scores 16PF Primary Factors

Competitive Group A 14 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
C1	15	7	11	10	12	17	11	14	8	5	9	10	8	10
C2	5	8	8	10	11	12	11	5	6	12	16	12	9	13
C3	12	9	4	10	12	16	12	15	14	14	10	12	6	10
C4	9	8	11	10	7	10	15	7	1	4	7	10	11	4
C5	14	9	14	2	15	18	11	13	6	2	5	3	9	4
C6	9	6	13	11	10	13	10	12	6	5	9	12	10	7
C9	16	7	14	6	14	14	10	17	7	4	6	2	10	6
C10	10	7	10	12	13	13	6	11	13	6	15	7	9	12
C11	11	9	12	11	12	6	10	14	7	11	8	15	13	11
C12	10	8	10	13	11	17	12	9	7	7	13	9	11	10
C13	16	9	10	13	14	17	10	15	3	2	13	11	13	11
C14	10	7	8	9	10	11	8	10	10	8	9	11	13	11
C15	15	6	13	12	10	16	9	12	5	9	10	9	9	8
C17	8	7	3	12	15	12	6	4	12	13	12	10	11	10
C18	5	8	5	9	12	9	9	4	4	5	12	13	11	11
C20	6	6	12	8	13	11	12	14	5	6	9	10	10	8
C21	13	8	10	9	13	15	10	14	5	5	10	11	11	8
C25	20	5	18	2	8	16	14	20	4	4	2	12	10	0
C26	15	9	18	4	17	15	12	16	0	5	8	3	9	4
C27	11	6	8	11	10	10	11	9	13	7	12	9	13	8
C28	12	6	6	7	12	12	14	10	2	7	11	10	10	6
C29	13	9	12	12	16	15	9	14	1	10	12	10	9	9
C30	13	8	11	17	12	14	11	7	10	8	10	11	8	12
C31	10	7	6	15	8	15	8	12	4	4	15	12	10	12
C33	10	8	6	16	15	13	13	11	9	8	11	13	12	14
C34	6	9	10	6	12	12	11	11	5	13	8	10	13	7
C35	12	3	11	5	10	14	12	18	5	5	6	6	11	4
C36	8	3	6	12	14	16	14	11	10	14	8	10	12	12
C37	5	6	15	10	8	14	15	10	6	8	8	12	8	8
C38	19	6	17	7	14	11	11	16	4	3	6	8	15	5
C39	15	7	12	8	16	10	8	16	8	4	4	8	11	6
C42	9	10	7	12	8	8	6	8	4	5	11	12	8	9
C43	6	9	7	15	11	9	14	5	2	10	11	12	7	10
C45	16	7	19	3	6	6	20	16	6	7	6	12	16	2
C46	18	9	15	1	9	16	14	20	2	4	5	5	14	2
C47	16	9	12	18	18	16	11	16	8	9	6	4	10	10
C49	6	6	6	13	12	6	4	3	7	12	10	13	8	13
C51	10	7	6	13	14	8	9	6	8	5	14	15	8	8
C52	18	6	14	8	13	16	14	18	0	3	10	6	14	8
C54	5	7	9	13	12	13	11	10	5	10	10	10	7	9
C55	18	8	15	6	3	6	11	16	8	9	8	11	20	5
C56	18	8	16	0	14	14	16	18	8	8	8	7	16	4
C59	13	8	7	11	13	16	8	7	9	11	12	5	9	9
C60	10	6	14	11	14	12	11	10	2	6	3	15	6	11
C61	15	8	10	7	8	15	11	14	8	5	11	5	14	13
C62	18	8	15	11	12	16	12	13	8	5	7	10	14	10
C63	20	6	16	0	16	8	18	18	0	6	8	4	14	2
C65	13	9	14	9	13	12	12	14	4	6	6	5	12	3
C66	14	4	10	9	16	19	11	17	7	7	12	8	6	5
C67	5	6	8	9	13	10	9	11	8	11	9	16	7	10
C68	10	6	13	10	17	16	10	13	4	2	12	12	10	12
C69	11	9	3	13	13	13	5	13	6	8	13	12	8	12
C71	9	9	10	13	13	8	11	8	12	13	12	15	11	13
C72	13	5	11	8	10	8	12	11	8	10	8	6	14	9

TABLE 8.6

Raw Scores on 16 Primary Factors

Competitive Group 3 14 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
C76	15	9	9	11	11	12	10	12	7	2	9	9	11	9
C76	13	6	12	13	11	14	12	10	7	3	8	11	8	7
C78	12	7	15	12	13	15	12	10	2	7	8	11	10	5
C79	15	8	6	8	16	18	10	18	2	5	10	6	9	4
C80	7	10	6	9	9	6	11	12	11	6	15	12	11	12
C81	12	7	9	10	14	9	13	7	6	2	6	12	12	7
C82	13	3	13	4	15	13	9	17	2	8	6	11	6	6
C83	8	7	9	12	15	13	5	8	10	2	8	6	8	11
C85	17	8	14	13	10	17	9	12	8	5	9	2	5	9
C88	10	6	14	7	11	13	6	5	5	9	9	7	6	12
C90	11	6	5	13	9	12	15	11	6	8	9	12	13	4
C91	6	8	6	13	5	1	9	6	6	10	13	9	17	11
C92	12	9	9	10	11	10	10	11	5	8	9	11	8	10
C93	12	7	10	10	14	15	13	13	8	5	9	11	12	9
C94	8	9	6	16	10	12	7	9	8	6	13	13	8	13
C95	17	7	14	8	15	15	15	15	9	6	7	15	10	6
C97	8	8	12	11	13	13	5	10	4	3	12	12	6	10
C98	14	9	16	8	8	9	19	13	10	8	6	17	8	6
C99	6	8	6	7	8	5	18	7	10	15	9	15	16	8
C101	18	7	12	7	12	13	15	16	2	2	6	10	9	8
C103	14	7	9	9	10	12	8	8	5	4	10	8	8	8
C104	15	7	15	9	17	12	11	14	4	3	11	8	8	12
C105	14	6	13	9	17	16	11	15	3	4	8	14	12	4
C106	5	9	12	13	14	12	13	7	7	11	11	15	13	9
C107	11	9	13	9	14	18	9	13	4	7	12	7	12	6
C108	10	7	6	13	12	11	7	6	4	10	15	10	10	14
C109	14	5	16	8	16	12	18	10	2	8	8	10	16	6
C110	14	9	14	9	12	11	15	16	13	4	12	9	12	8
C111	14	8	7	14	12	15	7	9	8	11	14	12	7	12
C112	9	9	9	11	7	7	12	7	12	10	5	13	15	9
C113	12	5	14	8	12	10	15	17	8	10	8	10	14	4
C115	13	7	6	15	10	12	16	6	6	6	12	7	10	12
C117	8	9	6	11	7	10	8	11	4	8	9	11	12	10
C118	10	8	7	11	12	18	13	15	8	6	8	7	6	10
C119	14	9	11	11	11	13	10	9	7	8	14	15	10	7
C120	7	7	9	9	16	8	11	10	1	10	8	13	15	10
C121	14	9	9	7	11	10	12	10	10	3	12	6	10	9
C122	12	6	15	6	10	12	13	14	8	6	6	6	12	6
C123	9	8	6	15	14	11	9	5	2	3	13	14	11	14
C124	15	9	8	12	11	10	18	13	6	6	10	6	12	14
C125	16	8	16	13	15	10	16	12	0	3	6	10	11	7
C126	14	8	10	12	16	14	8	10	2	8	4	10	12	8
C127	11	9	11	10	10	9	15	9	2	9	7	8	9	8
C128	13	7	11	7	7	11	6	8	7	7	9	14	10	10
C130	11	7	12	7	9	8	10	10	9	11	11	12	12	8
C131	8	8	13	8	10	9	12	10	8	8	11	8	13	6
C132	13	6	9	10	18	13	6	10	2	7	4	16	9	10
C133	16	5	11	12	10	9	10	6	4	16	8	15	14	10
C135	8	8	9	16	15	13	12	11	12	6	12	10	9	10
C136	12	5	13	10	11	9	11	7	11	6	6	5	10	3
C139	12	6	8	10	12	14	12	12	4	16	8	10	11	8
C140	14	8	8	12	12	16	8	10	4	8	10	10	14	14

TABLE 8.7

Raw Scores HSPQ Primary Factors

Control Group A 12 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
N1	10	4	13	7	7	11	12	11	9	6	10	10	14	5
N2	10	9	5	14	13	5	9	5	6	10	13	11	12	13
N3	12	8	15	14	17	20	6	12	6	4	13	9	8	8
N4	10	6	4	16	14	7	8	5	16	10	13	7	11	8
N5	4	5	12	11	13	11	7	12	6	10	11	10	9	10
N6	5	6	4	11	6	12	5	12	7	9	10	9	5	6
N9	10	6	15	13	10	14	15	9	4	6	10	8	6	8
N10	3	6	8	11	7	7	9	6	4	8	15	15	7	9
N11	5	8	8	16	9	11	8	3	8	12	13	8	10	10
N12	8	9	9	8	3	8	7	8	5	8	11	16	10	7
N13	8	8	10	14	5	6	11	14	6	9	10	11	8	10
N14	9	9	3	14	11	9	13	12	6	6	14	12	8	8
N15	12	5	14	10	12	14	10	8	14	8	9	8	10	10
N17	16	6	12	7	14	10	13	10	2	1	10	8	13	6
N18	12	4	6	13	10	12	10	12	6	6	10	12	7	12
N20	6	9	5	16	7	11	9	5	2	6	12	11	12	8
N21	15	6	13	11	11	13	12	15	9	8	14	12	10	9
N25	3	6	5	10	12	11	11	8	11	12	8	12	10	6
N26	9	7	12	12	9	9	12	12	8	9	11	14	15	11
N27	13	7	13	9	14	13	10	11	6	10	10	15	14	9
N28	12	7	5	16	8	11	10	10	7	7	12	12	11	13
N29	9	8	16	12	9	10	14	15	6	11	7	11	15	4
N30	8	9	10	10	8	14	3	8	14	4	16	10	4	10
N31	8	5	8	14	16	7	9	5	6	8	11	14	14	14
N33	12	4	15	12	14	15	12	8	8	8	15	6	8	8
N34	7	9	5	11	10	12	15	8	8	8	17	16	10	13
N35	10	5	10	8	15	7	13	12	4	10	13	10	10	7
N36	9	8	6	10	7	11	12	9	9	8	12	8	13	9
N37	10	5	9	14	9	7	9	11	8	8	14	9	6	10
N38	11	9	12	10	5	9	11	10	9	15	12	7	14	6
N39	4	7	5	12	9	6	6	7	6	8	12	14	9	16
N42	13	7	13	16	15	15	9	8	10	10	4	10	10	14
N43	10	8	5	11	4	13	12	10	5	9	9	16	15	12
N45	10	8	12	14	10	14	9	11	9	6	17	6	13	9
N46	13	8	6	14	12	16	10	12	5	4	12	8	5	8
N47	12	9	8	8	5	12	13	11	12	8	9	11	13	7
N49	6	4	9	14	10	9	10	6	8	8	15	9	7	6
N51	12	5	9	10	11	4	5	6	8	10	12	13	13	13
N52	9	7	12	9	8	9	14	11	6	8	10	12	11	5
N54	7	5	6	10	7	11	9	9	10	9	13	10	8	11
N55	11	8	5	14	6	10	13	8	2	10	14	14	13	5
N56	12	6	10	14	10	12	8	10	5	12	10	11	9	9
N59	10	8	11	13	11	12	12	11	5	7	5	10	15	8
N60	11	6	4	14	13	11	6	4	9	10	14	14	9	13
N61	10	9	11	9	6	14	13	14	2	12	8	15	18	5
N62	9	6	4	15	9	9	10	8	2	5	14	14	13	9
N63	8	8	11	14	13	10	11	8	8	12	14	17	12	10
N65	5	7	3	16	2	4	13	5	11	8	17	7	8	14
N66	9	5	6	18	6	10	10	3	8	10	11	15	9	14
N67	7	5	9	14	12	12	9	0	10	3	12	9	9	12
N68	10	4	8	15	12	11	12	9	10	7	16	12	11	14
N69	10	6	6	12	12	8	6	14	10	6	8	12	16	13
N71	6	5	6	14	5	6	7	7	9	8	10	10	10	10
N72	9	7	10	12	11	14	13	12	10	13	11	14	13	8

TABLE 8.8

Raw Scores HSPQ Primary Factors

Control Group B 12 Years of Age

Subject Number	L	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
N75	7	8	14	13	4	13	11	9	7	11	8	15	12	8
N76	9	6	7	16	10	11	5	2	5	8	15	10	8	14
N78	2	7	11	15	10	10	13	11	8	9	12	17	12	9
N79	9	8	8	13	3	7	7	8	11	9	14	13	13	13
N80	8	7	8	13	5	9	10	8	8	11	10	8	11	11
N81	7	4	8	8	11	9	12	7	13	9	11	13	13	10
N82	14	8	7	17	5	5	11	4	8	6	15	6	7	13
N83	10	8	8	16	10	8	7	8	12	10	15	12	9	10
N85	10	6	5	18	8	10	8	12	4	4	12	10	10	8
N88	8	7	9	11	12	10	14	8	7	4	15	3	5	10
N90	15	4	9	13	13	20	9	7	10	10	9	7	14	7
N91	8	7	5	16	8	9	6	4	14	13	13	11	11	9
N92	11	6	8	10	12	16	10	14	5	6	10	10	7	5
N93	8	4	9	10	11	8	9	13	4	8	13	10	9	11
N94	6	8	9	7	4	12	12	13	4	7	11	8	12	9
N95	6	7	10	9	3	8	11	7	2	8	14	17	11	10
N97	5	5	10	16	14	12	5	7	7	12	9	11	8	12
N98	7	8	14	19	16	9	13	8	8	11	6	12	15	14
N99	6	8	6	15	8	10	7	9	7	12	15	13	8	11
N101	11	7	11	11	7	8	9	12	3	9	11	7	12	10
N103	7	7	10	14	14	6	10	6	8	8	11	13	8	12
N104	12	7	11	11	7	6	12	10	8	6	7	7	15	7
N105	9	7	12	14	7	14	5	10	4	3	10	11	11	10
N106	9	6	11	13	8	11	14	7	7	9	9	15	16	12
N107	7	5	7	12	11	4	8	7	10	5	13	12	4	10
N108	13	8	14	17	6	9	13	8	3	3	8	14	12	8
N109	4	7	6	14	6	4	12	4	8	10	16	16	15	12
N110	10	9	9	10	3	7	13	9	8	4	4	14	18	6
N111	6	7	11	12	9	10	7	10	6	8	10	6	10	6
N112	9	8	7	15	12	11	3	4	11	4	12	9	9	15
N113	11	8	5	15	11	10	8	8	5	15	9	8	8	13
N115	7	6	10	15	8	19	12	12	9	12	12	14	13	11
N117	10	8	3	16	11	6	9	6	9	12	6	15	6	13
N118	17	8	13	8	15	3	12	16	4	5	7	10	8	6
N119	9	3	9	12	10	13	9	11	12	6	8	9	9	11
N120	6	7	8	11	9	11	10	10	4	12	13	11	10	5
N121	18	4	5	10	17	12	13	8	4	10	14	12	8	9
N122	11	6	12	10	14	13	4	13	8	8	12	11	10	14
N123	4	6	6	14	11	11	8	9	10	8	7	12	11	12
N124	9	6	6	6	4	8	13	14	10	10	12	13	11	10
N125	8	8	12	9	17	16	7	7	4	6	5	11	10	5
N126	11	7	7	15	11	8	9	1	4	9	10	12	10	12
N127	9	9	9	8	10	12	8	9	9	8	7	8	8	6
N128	1	6	8	4	2	5	11	8	6	6	10	19	14	5
N130	8	6	10	17	12	13	15	9	6	3	10	6	12	16
N131	13	7	10	12	8	14	14	15	7	4	4	8	8	9
N132	10	5	15	9	12	7	10	8	9	5	16	10	11	9
N133	7	9	7	17	9	9	6	8	8	4	7	7	11	8
N135	12	6	14	10	8	11	10	11	4	6	10	9	12	9
N136	4	6	10	11	7	9	12	9	10	9	8	13	8	7
N139	16	7	8	10	15	13	12	7	7	6	18	10	11	13
N140	11	6	4	11	11	15	4	11	7	9	11	11	9	6

TABLE 8.9

Raw Scores 16PF Primary Factors

Control Group - 13 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
N1	9	6	10	14	14	9	12	9	5	10	8	11	15	12
N2	6	7	7	10	11	7	9	9	8	8	14	15	8	10
N3	10	7	13	16	14	15	11	15	4	8	12	10	10	8
N4	13	7	2	18	10	12	7	5	15	8	18	9	10	14
N5	8	6	8	11	6	14	10	14	6	15	7	16	11	9
N6	6	6	9	15	13	15	5	8	8	8	12	13	8	14
N9	16	6	7	11	14	12	9	6	4	4	10	13	10	12
N10	6	9	4	11	6	3	12	10	9	10	15	13	12	9
N11	11	8	4	16	11	7	7	3	12	15	18	10	12	14
N12	9	8	7	13	8	13	7	2	1	9	7	16	12	10
N13	12	7	10	14	9	11	17	13	5	4	8	12	14	11
N14	13	9	5	15	7	11	14	9	10	12	14	14	7	6
N15	10	4	13	8	7	11	15	14	6	9	7	9	10	7
N17	14	5	10	8	12	13	13	9	4	5	11	12	16	10
N18	11	5	11	11	12	9	10	8	7	10	11	9	9	8
N20	8	8	12	9	10	9	16	8	6	5	13	12	10	6
N21	12	9	13	10	15	12	11	13	11	6	8	8	8	4
N25	6	5	8	9	9	10	13	12	6	10	9	14	8	10
N26	11	7	11	11	8	11	8	11	8	9	10	12	11	9
N27	8	4	14	12	11	12	8	11	9	9	6	6	10	11
N28	10	8	9	14	10	15	8	5	9	10	15	8	9	11
N29	15	8	12	11	10	14	15	15	6	6	10	11	13	8
N30	10	8	10	11	16	8	7	14	14	8	13	5	10	12
N31	14	8	8	15	12	11	10	5	8	8	17	12	6	12
N33	12	7	9	16	12	14	7	11	6	12	18	10	6	10
N34	8	8	1	18	14	16	6	7	8	14	18	15	10	12
N35	20	7	9	6	7	8	16	10	7	6	14	9	9	2
N36	5	8	4	15	9	9	10	6	11	11	13	9	12	12
N37	11	7	8	9	10	9	7	8	6	8	12	12	8	14
N38	5	8	9	10	7	6	11	11	13	12	12	14	14	5
N39	5	5	8	10	8	8	7	9	5	6	11	9	9	12
N42	12	5	9	18	15	17	3	7	5	10	14	10	8	12
N43	7	8	6	17	9	11	10	6	3	7	14	14	9	13
N45	15	7	7	14	13	8	8	9	7	7	14	9	10	10
N46	11	8	6	14	14	16	6	8	6	5	10	4	5	12
N47	15	8	4	13	11	13	7	13	9	8	16	13	8	12
N49	7	4	5	20	13	9	6	6	4	7	13	14	5	13
N51	8	8	11	14	10	10	11	6	10	12	10	9	14	15
N52	11	5	12	11	8	12	9	10	7	10	9	11	12	10
N54	7	6	8	12	4	5	14	8	8	10	15	13	14	11
N55	13	6	4	14	10	15	3	10	7	12	17	9	10	8
N56	9	7	9	7	9	14	13	13	7	8	8	9	13	7
N59	8	4	7	10	12	10	15	6	4	5	12	10	10	6
N60	9	7	2	18	10	13	3	4	9	7	17	14	8	15
N61	14	9	10	9	6	16	13	14	4	10	8	14	18	6
N62	10	9	7	13	12	11	11	11	2	4	13	11	12	10
N63	9	8	9	10	6	12	15	8	8	9	10	15	11	12
N65	6	7	2	16	8	4	11	6	4	11	16	12	4	10
N66	9	8	8	16	7	6	13	6	6	7	12	11	14	12
N67	10	4	9	12	10	12	11	8	11	6	12	10	14	10
N68	14	7	11	16	10	13	14	8	8	9	12	4	10	10
N69	10	7	4	18	12	12	8	6	6	10	14	10	8	12
N71	10	6	6	14	7	5	8	5	8	9	12	12	11	10
N72	11	7	11	7	9	13	12	11	9	11	8	12	10	5

TABLE 8.10

Raw Scores on Primary Factors

Control Group B 13 Years of age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
N75	15	9	11	12	5	9	10	5	7	8	13	12	14	8
N76	15	6	10	14	11	14	9	5	4	10	11	10	11	9
N78	10	7	5	16	8	16	11	11	6	9	10	11	14	10
N79	8	8	4	17	10	8	11	8	14	15	14	14	11	16
N80	8	8	7	17	17	8	8	4	4	12	16	10	4	14
N81	13	6	9	8	10	12	10	12	10	9	10	11	12	9
N82	9	9	4	15	8	8	4	7	8	8	13	3	4	13
N83	8	6	11	13	9	10	10	12	10	11	11	12	12	10
N85	6	6	4	14	12	12	10	9	2	5	12	12	8	10
N88	2	7	7	15	13	13	7	3	8	8	15	16	5	10
N90	16	6	18	10	16	16	11	16	2	8	6	9	14	2
N91	6	5	2	13	11	9	3	4	8	16	17	15	9	15
N92	15	8	13	10	13	16	12	10	7	7	12	13	12	5
N93	7	6	9	6	13	11	8	9	3	7	9	13	12	12
N94	12	7	10	14	6	10	11	14	6	3	9	10	11	12
N95	14	8	8	14	2	14	8	5	6	12	16	9	12	11
N97	7	9	10	16	13	13	9	9	10	10	8	14	9	9
N98	5	8	12	12	8	9	12	8	4	10	16	14	12	10
N99	10	7	7	16	8	9	7	9	8	11	14	15	12	16
N101	7	4	9	8	10	8	8	9	5	7	10	10	11	8
N103	8	8	6	12	16	12	4	7	3	12	14	13	5	9
N104	7	7	3	15	8	8	5	4	12	8	17	10	9	15
N105	11	7	6	15	5	7	9	5	8	8	15	9	12	9
N106	10	8	7	19	9	12	13	6	4	7	15	8	8	12
N107	6	7	7	16	8	11	5	6	11	8	13	13	6	14
N108	18	7	18	8	10	20	17	20	4	6	4	8	16	3
N109	2	8	4	4	9	5	7	6	12	11	16	12	18	15
N110	10	8	2	14	6	14	14	8	6	6	10	12	16	8
N111	6	8	11	8	8	8	13	11	6	10	10	12	9	6
N112	8	7	6	17	8	11	4	1	6	13	13	9	5	17
N113	6	7	1	16	7	10	4	6	2	9	10	13	8	15
N115	9	7	13	14	10	12	7	11	4	5	10	13	10	10
N117	9	8	9	14	12	10	11	7	8	13	5	10	9	13
N118	9	7	12	11	11	11	7	11	3	10	9	12	6	6
N119	12	6	7	8	5	11	13	7	6	7	14	11	15	10
N120	4	7	8	16	10	11	11	6	4	6	16	13	11	2
N121	14	8	11	9	15	15	13	11	4	10	8	10	10	7
N122	14	5	14	12	15	13	9	13	5	3	10	8	12	5
N123	8	5	10	12	10	8	5	4	12	10	10	13	9	6
N124	9	9	8	11	9	11	15	14	7	3	9	10	14	9
N125	9	4	14	10	15	11	11	10	1	7	10	11	14	6
N126	10	8	5	14	13	13	7	9	6	10	15	7	7	13
N127	8	8	8	12	10	9	10	6	12	7	17	13	11	8
N128	8	7	15	8	6	8	10	13	2	6	8	18	16	4
N130	3	4	6	14	14	16	6	8	3	7	10	13	16	9
N131	13	9	7	16	10	12	10	7	9	5	8	5	12	6
N132	10	6	15	5	10	13	12	12	9	8	5	9	10	5
N133	8	7	3	15	8	12	3	10	11	9	15	11	10	12
N135	5	5	14	11	13	13	12	11	2	6	10	8	9	10
N136	14	6	8	14	6	14	8	12	10	13	14	11	11	6
N139	14	9	7	13	11	17	12	7	6	10	14	7	8	15
N140	15	8	7	15	10	9	3	13	3	9	10	8	4	10

TABLE 8.11

Raw Scores HSPQ Primary Factors

Control Group A 14 Years of Age

Subject Number	A	B	C	L	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
N1	13	8	14	13	16	12	7	11	3	11	10	13	12	12
N2	12	7	9	13	13	14	8	12	9	5	8	11	7	11
N3	14	7	10	16	16	18	10	18	6	6	8	10	8	8
N4	6	8	2	20	14	13	3	5	18	16	16	11	10	16
N5	6	5	5	9	9	10	10	17	10	6	10	14	14	10
N6	11	6	12	16	10	18	6	7	10	9	15	10	6	12
N9	14	6	12	15	17	15	14	3	6	6	14	12	10	8
N10	4	7	4	13	9	2	6	3	12	12	15	16	12	10
N11	18	8	4	20	14	10	5	1	9	10	16	6	8	11
N12	11	8	4	18	7	5	5	2	7	10	9	14	10	12
N13	14	8	9	12	15	10	16	12	10	6	13	12	14	10
N14	16	9	11	11	7	12	12	13	6	6	13	12	2	6
N15	16	6	14	8	14	10	12	7	9	11	12	13	8	11
N17	14	7	11	13	14	12	14	8	4	4	5	8	12	16
N18	11	7	14	10	11	9	11	9	8	6	13	14	12	6
N20	7	9	8	14	11	8	11	12	2	6	10	10	6	11
N21	14	7	13	8	10	16	12	13	6	6	11	11	7	8
N25	8	3	12	13	6	11	8	11	6	8	13	11	7	9
N26	9	8	6	10	10	9	4	9	11	12	12	14	10	10
N27	11	6	13	7	6	10	9	10	5	11	4	11	15	13
N28	8	7	9	13	12	12	9	7	4	10	11	6	8	13
N29	16	8	19	13	15	17	12	16	5	6	11	7	8	12
N30	12	8	15	10	14	10	11	11	8	5	13	7	14	13
N31	4	6	4	7	16	11	10	5	6	7	11	11	10	12
N33	16	6	17	9	14	17	9	15	4	13	9	10	11	4
N34	5	7	0	14	16	14	3	3	10	11	18	13	4	14
N35	14	7	13	5	14	12	14	16	4	4	10	8	8	0
N36	7	8	5	14	10	11	6	6	5	13	14	12	10	10
N37	13	4	9	11	9	13	10	11	9	5	12	12	7	9
N38	7	9	5	13	6	7	7	6	12	13	16	11	12	13
N39	7	5	4	11	4	5	7	6	12	8	15	11	13	8
N42	11	7	7	18	13	13	5	1	12	10	13	15	6	14
N43	6	8	5	20	12	6	8	5	8	10	14	13	6	14
N45	10	8	6	15	12	9	6	7	5	7	14	11	9	12
N46	8	9	10	8	18	15	10	13	2	3	6	7	11	8
N47	7	8	5	11	9	11	12	3	10	14	16	13	8	16
N49	9	8	7	18	12	4	5	2	8	2	16	14	10	15
N51	7	8	8	13	10	7	4	5	11	6	15	8	7	13
N52	14	6	16	9	11	10	13	12	1	2	4	6	7	3
N54	13	5	6	14	8	13	12	13	8	5	12	10	4	4
N55	11	9	5	16	17	14	3	10	6	12	15	12	8	14
N56	9	7	8	11	8	12	8	9	4	5	16	11	11	12
N59	9	7	11	12	14	11	10	9	5	5	9	17	10	10
N60	10	7	5	19	10	10	7	4	4	18	14	20	6	14
N61	8	9	10	10	4	12	10	9	6	12	14	10	10	8
N62	10	8	2	18	14	7	5	9	2	5	16	14	6	8
N63	8	9	9	16	10	6	6	5	8	8	12	13	9	10
N65	4	6	0	17	9	6	9	0	8	10	16	13	9	13
N66	12	8	8	14	9	13	19	11	6	6	14	6	12	13
N67	14	6	10	12	14	14	14	9	6	5	9	13	11	10
N68	12	8	13	20	12	15	12	12	8	8	14	4	10	12
N69	10	8	7	14	12	13	6	10	7	8	16	5	11	12
N71	5	8	7	15	4	7	8	4	7	7	15	16	9	13
N72	11	8	10	11	12	10	9	12	8	10	7	11	11	11

TABLE 8.12

Raw Scores 16PF Primary Factors

Control Group B 14 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
N75	15	9	15	11	10	9	10	9	5	10	8	10	12	7
N76	10	6	8	17	10	16	6	5	9	10	12	12	8	14
N78	8	6	14	15	11	14	9	10	7	4	12	4	12	13
N79	5	8	3	15	9	7	4	5	15	7	16	13	10	11
N80	5	10	6	17	18	16	7	5	7	9	14	11	6	13
N81	11	5	12	4	9	9	12	9	11	6	8	12	14	3
N82	7	8	4	17	11	9	9	10	12	10	7	8	7	11
N83	10	6	11	9	11	12	11	5	7	10	10	12	12	10
N85	8	7	5	14	12	13	12	11	2	6	13	11	8	12
N86	8	8	5	13	12	9	8	1	4	12	15	19	10	10
N90	15	8	16	12	20	18	8	16	3	7	1	12	14	0
N91	4	5	2	13	12	10	4	0	4	12	13	16	9	14
N92	15	7	15	9	13	20	9	15	5	4	9	6	11	8
N93	11	8	9	10	11	11	15	8	4	4	7	14	9	3
N94	8	7	7	10	13	9	7	9	8	5	12	12	6	12
N95	14	7	7	9	6	14	13	7	8	9	13	9	13	9
N97	7	7	10	14	10	11	9	11	6	7	11	18	14	4
N98	8	9	15	11	12	10	12	18	10	15	3	12	13	4
N99	12	8	10	17	10	12	8	3	7	9	12	12	8	15
N101	14	7	11	9	14	14	9	12	3	4	12	10	13	8
N103	10	8	4	17	17	11	4	6	2	5	13	9	4	12
N104	12	8	6	20	8	10	8	3	12	12	15	12	14	14
N105	8	5	8	15	9	7	11	5	6	8	12	5	10	10
N106	14	9	7	17	10	11	15	12	9	8	16	8	8	14
N107	4	8	4	10	7	11	8	2	11	5	20	15	7	12
N108	14	9	19	7	8	12	14	15	0	3	2	12	17	2
N109	0	8	2	16	4	6	6	6	16	18	14	16	16	14
N110	12	7	2	18	6	6	6	4	10	8	16	14	8	10
N111	12	7	15	10	12	11	10	16	5	8	8	11	11	6
N112	12	8	4	14	14	19	12	2	6	6	14	12	6	17
N113	8	7	3	13	4	9	10	5	3	8	11	9	13	13
N115	14	7	11	20	13	19	6	8	11	9	16	14	8	12
N117	9	8	14	4	12	9	13	11	5	11	3	13	9	7
N118	6	8	13	12	10	11	9	13	6	10	7	11	11	9
N119	10	6	4	13	11	7	4	15	10	9	12	11	10	16
N120	7	5	4	11	14	14	7	11	2	8	11	9	5	9
N121	13	8	16	11	17	18	14	12	0	6	5	9	10	4
N122	11	7	12	12	14	6	7	9	5	9	10	9	12	8
N123	10	5	11	11	8	13	12	13	6	8	9	14	6	12
N124	10	7	9	13	11	8	10	12	5	9	8	12	13	9
N125	10	7	13	8	14	11	16	15	4	5	6	11	15	7
N126	10	8	7	16	13	12	6	7	10	11	12	11	9	14
N127	11	9	7	10	7	5	8	4	15	13	13	12	10	9
N128	8	5	10	2	10	6	11	14	6	4	14	16	14	4
N130	8	6	8	11	13	10	10	9	3	6	11	9	10	9
N131	17	9	9	16	9	12	13	13	6	5	11	5	11	12
N132	9	6	12	10	12	17	12	14	6	7	7	11	12	9
N133	6	7	6	16	9	11	10	11	10	6	14	14	10	9
N135	7	6	12	8	4	6	10	12	4	11	7	16	9	8
N136	8	7	2	11	6	12	8	11	8	14	10	16	9	8
N139	16	8	8	14	17	19	9	12	7	10	14	12	6	10
N140	18	9	12	8	10	11	11	12	1	5	8	12	8	6

TABLE 8.13

Raw Scores HSPQ Primary Factors

Competitive Drop Outs 12 Years of Age

Subject Number	A	B	C	D	E	F	G	H	I	J	O	Q_2	Q_3	Q_4
C7	14	4	9	15	10	14	11	7	10	8	16	8	10	5
C16	9	5	17	7	8	12	12	11	12	1	4	11	14	6
C19	7	8	8	16	12	11	5	9	11	5	17	14	8	14
C23	4	7	8	12	5	5	5	13	10	9	12	12	10	14
C32	16	7	10	6	16	18	15	16	2	4	6	4	14	10
C 40	8	7	10	11	11	12	11	11	6	8	9	14	8	9
C41	10	3	8	14	6	7	10	10	7	8	10	13	11	11
C44	6	8	8	9	5	4	9	10	8	8	12	12	8	13
C48	9	7	13	10	9	7	10	11	6	7	10	13	8	5
C50	10	7	10	11	14	14	12	12	7	7	10	12	10	10
C53	14	8	2	6	11	13	11	8	4	8	8	7	10	6
C57	6	8	12	11	10	14	12	15	15	12	13	12	17	8
C64	13	6	8	10	8	12	11	10	9	7	12	12	9	8
C73	14	3	14	7	11	15	9	9	7	4	7	9	10	7
C74	6	3	7	9	15	15	7	11	4	13	8	11	10	11
C84	8	7	12	16	9	12	9	7	5	11	9	10	16	9
C87	8	8	10	4	9	12	13	11	6	1	12	7	10	8
C89	12	7	12	12	7	17	14	10	5	5	14	8	13	5
C96	2	7	5	16	10	6	6	9	5	11	13	13	7	11
C100	20	7	10	9	8	12	13	11	6	2	6	5	16	7
C102	17	6	14	7	9	9	15	16	6	6	10	11	10	3
C114	12	8	16	12	14	14	12	12	6	7	13	11	14	6
C116	8	5	10	10	7	12	5	10	5	13	8	7	11	11
C137	3	5	4	19	9	9	10	4	11	14	16	12	6	8
C138	10	6	12	10	6	6	8	10	9	8	10	10	12	10
C141	13	6	14	8	14	16	8	14	7	10	4	6	12	8

TABLE 8.14

Raw Scores JEPI Extraversion and Neuroticism

Competitive Group A 12 Years of Age

	E	N		E	N		E	N
C1	23	3	C26	19	6	C49	19	21
C2	18	15	C27	18	11	C51	20	9
C3	23	16	C28	17	7	C52	20	2
C4	13	11	C29	22	5	C54	17	19
C5	20	17	C30	20	5	C55	20	10
C6	17	8	C31	17	15	C56	17	11
C9	21	14	C33	21	7	C59	23	17
C10	17	19	C34	20	9	C60	17	9
C11	18	14	C35	18	7	C61	21	13
C12	18	10	C36	19	15	C62	24	8
C13	14	12	C37	18	9	C63	21	12
C14	19	9	C38	20	9	C65	17	15
C15	21	13	C39	23	16	C66	18	6
C17	11	18	C42	18	8	C67	12	10
C18	20	22	C43	20	20	C68	18	8
C20	20	15	C45	19	7	C69	10	18
C21	22	20	C46	19	2	C71	17	19
C25	18	10	C47	20	11	C72	16	7

TABLE 8.15

Raw Scores JEPI Extraversion and Neuroticism

Competitive Group B 12 Years of Age

	E	N		E	N		E	N
C75	13	4	C98	19	5	C119	17	14
C76	19	16	C99	12	17	C120	15	17
C78	14	18	C101	21	5	C121	17	10
C79	20	16	C103	19	19	C122	21	10
C80	11	18	C104	18	18	C123	21	19
C81	14	5	C105	19	8	C124	20	13
C82	20	8	C106	15	16	C125	21	13
C83	17	7	C107	22	6	C126	22	9
C85	23	14	C108	19	14	C127	19	6
C88	15	11	C109	17	17	C128	10	19
C90	19	13	C110	17	9	C130	12	12
C91	16	16	C111	10	8	C131	22	15
C92	12	15	C112	17	15	C132	5	10
C93	19	18	C113	23	8	C133	19	18
C94	19	17	C115	18	11	C135	21	16
C95	18	9	C117	19	10	C136	22	14
C97	20	9	C118	20	3	C139	16	9
						C140	16	12

TABLE 8.16

Raw Scores JEPI Extraversion and Neuroticism

Competitive Group A 13 Years of Age

	E	N		E	N		E	N
C1	24	4	C26	18	10	C49	19	20
C2	15	15	C27	19	8	C51	18	10
C3	24	15	C28	21	11	C52	23	6
C4	16	18	C29	22	7	C54	18	17
C5	21	19	C30	24	7	C55	19	2
C6	21	14	C31	19	22	C56	24	3
C9	24	4	C33	16	19	C59	24	22
C10	15	20	C34	20	9	C60	13	17
C11	13	21	C35	20	7	C61	20	13
C12	21	19	C36	19	21	C62	22	8
C13	17	18	C37	21	8	C63	22	8
C14	19	13	C38	21	6	C65	21	7
C15	12	10	C39	22	8	C66	20	7
C17	16	9	C42	16	14	C67	17	12
C18	17	22	C43	17	21	C68	21	14
C20	18	13	C45	18	10	C69	14	19
C21	21	8	C46	21	0	C71	20	22
C25	17	7	C47	21	11	C72	18	7

TABLE 8.17

Raw Scores JEPI Extraversion and Neuroticism

Competitive Group B 13 Years of Age

	E	N		E	N.		E	N
C75	21	12	C98	21	6	C119	17	13
C76	22	13	C99	14	9	C120	20	13
C78	17	14	C101	22	5	C121	14	9
C79	20	17	C103	23	13	C122	20	9
C80	18	14	C104	23	9	C123	18	20
C81	21	10	C105	15	12	C124	21	17
C82	20	7	C106	9	13	C125	20	8
C83	22	10	C107	22	18	C126	20	10
C85	23	13	C108	22	16	C127	19	10
C88	21	11	C109	18	12	C128	12	14
C90	21	8	C110	21	4	C130	14	7
C91	9	13	C111	13	13	C131	23	11
C92	19	14	C112	7	19	C132	22	10
C93	18	10	C113	23	6	C133	13	13
C94	16	16	C115	20	15	C135	16	15
C95	22	12	C117	18	9	C136	21	19
C97	23	6	C118	21	5	C139	14	13
						C140	22	11

TABLE 8.18

Raw Scores JEPI Extraversion and Neuroticism

Competitive Group A 14 Years of Age

	E	N		E	N		E	N
C1	24	9	C26	18	2	C49	21	22
C2	22	22	C27	18	21	C51	20	15
C3	24	17	C28	21	9	C52	23	7
C4	16	10	C29	23	14	C54	10	15
C5	24	11	C30	18	10	C55	21	0
C6	20	5	C31	17	18	C56	23	3
C9	24	4	C33	22	18	C59	24	21
C10	16	14	C34	21	15	C60	16	11
C11	18	16	C35	21	5	C61	18	12
C12	20	15	C36	21	19	C62	23	8
C13	19	11	C37	23	13	C63	22	2
C14	15	11	C38	22	3	C65	21	3
C15	22	13	C39	22	4	C66	17	11
C17	16	17	C42	15	16	C67	14	12
C18	16	19	C43	16	20	C68	22	12
C20	20	4	C45	16	5	C69	18	19
C21	21	3	C46	23	1	C71	18	21
C25	24	3	C47	21	12	C72	21	8

TABLE 8.19

Raw Scores JEPI Extraversion and Neuroticism

Competitive Group B 14 Years of Age

	E	N		E	N		E	N
C75	22	7	C98	22	8	C119	17	18
C76	23	16	C99	8	15	C120	15	18
C78	22	13	C101	22	6	C121	20	11
C79	21	8	C103	22	12	C122	23	8
C80	17	21	C104	23	13	C123	18	18
C81	20	11	C105	20	8	C124	21	13
C82	19	3	C106	13	13	C125	20	10
C83	14	15	C107	23	12	C126	22	9
C85	22	13	C108	21	16	C127	16	5
C88	18	8	C109	22	13	C128	21	13
C90	21	14	C110	19	9	C130	13	4
C91	11	7	C111	13	16	C131	24	7
C92	16	12	C112	16	11	C132	21	8
C93	22	15	C113	22	3	C133	14	19
C94	21	15	C115	22	19	C135	20	16
C95	19	7	C117	17	7	C136	22	14
C 97	21	11	C118	23	3	C139	19	13
						C140	19	9

TABLE 8.20

Raw Scores JEPI Extraversion and Neuroticism

Control Group A 12 Years of Age

	E	N		E	N		E	N
N1	19	11	N26	21	12	N49	18	14
N2	14	19	N27	20	7	N51	13	19
N3	22	5	N28	19	11	N52	20	9
N4	16	16	N29	22	8	N54	18	15
N5	17	11	N30	19	10	N55	19	18
N6	16	16	N31	19	11	N56	16	13
N9	19	14	N33	19	13	N59	20	7
N10	15	14	N34	20	16	N60	20	24
N11	16	15	N35	17	11	N61	21	17
N12	18	14	N36	17	15	N62	21	13
N13	18	10	N37	14	12	N63	14	15
N14	20	15	N38	17	14	N65	14	20
N15	18	15	N39	18	13	N66	18	16
N17	20	2	N42	21	18	N67	18	21
N18	21	10	N43	22	10	N68	21	19
N20	16	16	N45	20	11	N69	17	13
N21	23	14	N46	20	18	N71	19	18
N25	4	7	N47	20	11	N72	21	18

TABLE 8.21

Raw Scores JEPI Extraversion and Neuroticism

Control Group B 12 Years of Age

	E	N		E	N		E	N
N75	10	6	N98	6	6	N119	14	14
N76	22	18	N99	17	20	N120	18	18
N78	17	15	N101	18	15	N121	22	12
N79	9	19	N103	18	17	N122	19	12
N80	15	14	N104	18	2	N123	19	12
N81	15	17	N105	20	15	N124	16	11
N82	18	16	N106	14	18	N125	20	15
N83	17	17	N107	16	13	N126	14	16
N85	16	10	N108	18	15	N127	18	13
N88	15	16	N109	9	15	N128	15	3
N90	23	13	N110	17	16	N130	17	15
N91	14	21	N111	17	8	N131	20	12
N92	16	16	N112	19	18	N132	20	10
N93	16	16	N113	12	12	N133	19	15
N94	20	12	N115	19	6	N135	22	2
N95	19	14	N117	11	17	N136	16	4
N97	16	17	N118	19	9	N139	23	16
						N140	20	11

TABLE 8.22

Raw Scores JEPI Extraversion and Neuroticism

Control Group A 13 Years of Age

	E	N		E	N		E	N
N1	17	6	N26	12	16	N49	17	22
N2	18	10	N27	23	11	N51	17	24
N3	24	5	N28	22	19	N52	18	7
N4	13	23	N29	17	6	N54	17	6
N5	12	15	N30	21	11	N55	21	17
N6	19	18	N31	17	11	N56	21	4
N9	18	20	N33	22	14	N59	19	10
N10	10	15	N34	17	20	N60	22	21
N11	14	21	N35	20	9	N61	22	18
N12	18	17	N36	18	21	N62	24	8
N13	23	13	N37	16	12	N63	16	11
N14	21	21	N38	13	11	N65	17	24
N15	18	7	N39	17	14	N66	16	18
N17	17	4	N42	22	22	N67	17	18
N18	18	15	N43	19	17	N68	23	18
N20	18	14	N45	21	16	N69	17	21
N21	22	12	N46	19	16	N71	18	19
N25	18	15	N47	15	18	N72	14	8

TABLE 8.23

Raw Scores JEPI Extraversion and Neuroticism

Control Group B 13 Years of Age

	E	N		E	N		E	N
N75	9	8	N98	5	6	N119	18	15
N76	23	15	N99	18	19	N120	17	15
N78	18	16	N101	21	8	N121	23	8
N79	14	22	N103	21	7	N122	20	6
N80	16	21	N104	15	11	N123	15	7
N81	11	3	N105	24	15	N124	20	11
N82	18	10	N106	18	21	N125	17	12
N83	15	14	N107	16	20	N126	16	18
N85	18	17	N108	22	4	N127	13	15
N88	13	18	N109	1	15	N128	22	6
N90	20	4	N110	20	16	N130	19	14
N91	9	20	N111	21	5	N131	21	11
N92	20	8	N112	15	21	N132	18	9
N93	18	11	N113	10	17	N133	20	16
N94	17	14	N115	21	14	N135	18	13
N95	20	17	N117	15	14	N136	18	19
N97	18	12	N118	22	13	N139	20	12
						N140	13	14

TABLE 8.24

Raw Scores JEPI Extraversion and Neuroticism

Control Group A 14 Years of Age

	E	N		E	N		E	N
N1	16	7	N26	11	19	N49	16	22
N2	21	10	N27	21	13	N51	17	23
N3	20	6	N28	22	17	N52	24	12
N4	7	24	N29	23	2	N54	16	7
N5	15	11	N30	23	13	N55	21	16
N6	17	19	N31	18	8	N56	19	5
N9	20	15	N33	23	7	N59	20	7
N10	5	18	N34	21	20	N60	20	24
N11	22	20	N35	21	3	N61	21	17
N12	14	20	N36	17	21	N62	21	8
N13	22	17	N37	18	13	N63	18	18
N14	19	15	N38	14	21	N65	15	23
N15	22	6	N39	14	16	N66	22	13
N17	20	15	N42	19	20	N67	23	6
N18	20	11	N43	14	19	N68	24	23
N20	16	14	N45	22	17	N69	21	16
N21	23	14	N46	21	13	N71	17	21
N25	19	14	N47	10	21	N72	15	2

TABLE 8.25

Raw Scores JEPI Extraversion and Neuroticism

Control Group B 14 Years of Age

	E	N		E	N		E	N
N75	12	11	N98	8	2	N119	10	12
N76	22	18	N99	17	20	N120	21	16
N78	18	15	N101	21	11	N121	21	6
N79	12	21	N103	17	13	N122	19	11
N80	15	16	N104	17	15	N123	19	7
N81	16	3	N105	20	18	N124	18	8
N82	18	14	N106	21	19	N125	19	5
N83	18	11	N107	14	19	N126	18	21
N85	15	19	N108	22	4	N127	11	16
N88	11	18	N109	1	15	N128	17	6
N90	22	4	N110	23	20	N130	16	18
N91	14	22	N111	20	5	N131	22	14
N92	23	8	N112	21	17	N132	21	12
N93	21	3	N113	14	19	N133	22	15
N94	18	18	N115	19	15	N135	15	8
N95	21	12	N117	19	4	N136	15	14
N97	17	6	N118	22	8	N139	18	16
						N140	21	12

TABLE 8.26

Raw Scores JEPI Extraversion and Neuroticism

Competitive Drop Outs 12 Years of Age

	E	N		E	N		E	N
C7	18	12	C50	18	13	C96	12	14
C16	20	10	C53	19	14	C100	21	13
C19	19	19	C57	20	19	C102	20	11
C23	16	10	C64	21	22	C114	18	11
C32	18	2	C73	20	9	C116	16	10
C40	19	16	C74	19	12	C137	11	20
C41	20	14	C84	14	14	C138	20	16
C44	19	13	C87	15	5	C141	17	4
C48	19	3	C89	22	7			

TABLE 8.27

Raw Scores (lbs.) Left Grip Test

Competitive Group A 12 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
C1	75	C14	48	C30	50	C45	70	C61	30
C2	50	C15	55	C31	55	C46	50	C62	60
C3	60	C17	60	C33	100	C47	65	C63	50
C4	45	C18	50	C34	45	C49	50	C65	55
C5	55	C20	35	C35	75	C51	60	C66	50
C6	40	C21	55	C36	60	C52	90	C67	58
C9	40	C25	55	C37	30	C54	50	C68	30
C10	35	C26	25	C38	65	C55	40	C69	35
C11	40	C27	45	C39	30	C56	90	C71	30
C12	60	C28	30	C42	75	C59	65	C72	75
C13	35	C29	50	C43	50	C60	75		

TABLE 8.28

Raw Scores (lbs) Left Grip Test

Competitive Group B 12 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
C75	55	C91	60	C105	70	C118	60	C130	80
C76	65	C92	75	C106	40	C119	60	C131	35
C78	55	C93	65	C107	45	C120	70	C132	45
C79	50	C94	55	C108	60	C121	65	C133	40
C80	62	C95	42	C109	60	C122	85	C135	50
C81	30	C97	62	C110	35	C123	50	C136	60
C82	75	C98	60	C111	40	C124	75	C139	72
C83	50	C99	70	C112	70	C125	55	C140	50
C85	60	C101	50	C113	60	C126	70		
C88	55	C103	60	C115	75	C127	42		
C90	70	C104	40	C117	105	C128	70		

TABLE 8.29

Raw Scores (lbs) Left Grip Test

Competitive Group A 13 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
C1	85	C14	60	C30	58	C45	70	C61	50
C2	60	C15	62	C31	65	C46	60	C62	100
C3	64	C17	90	C33	113	C47	102	C63	75
C4	65	C18	60	C34	78	C49	50	C65	70
C5	70	C20	55	C35	90	C51	65	C66	60
C6	65	C21	55	C36	75	C52	90	C67	58
C9	45	C25	60	C37	55	C54	58	C68	40
C10	35	C26	70	C38	75	C55	55	C69	48
C11	45	C27	50	C39	45	C56	90	C71	42
C12	75	C28	48	C42	82	C59	75	C72	100
C13	55	C29	50	C43	72	C60	92		

TABLE 8.30

Raw Scores (lbs.) Left Grip Test

Competitive Group B 13 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
C75	62	C91	60	C105	80	C118	70	C130	88
C76	70	C92	82	C106	50	C119	75	C131	48
C78	65	C93	75	C107	60	C120	85	C132	95
C79	55	C94	78	C108	75	C121	70	C133	52
C80	65	C95	40	C109	70	C122	60	C135	60
C81	52	C97	66	C110	48	C123	55	C136	62
C82	75	C98	50	C111	60	C124	80	C139	85
C83	60	C99	84	C112	80	C125	75	C140	50
C85	60	C101	65	C113	67	C126	70		
C88	82	C103	72	C115	80	C127	47		
C90	75	C104	75	C117	110	C128	80		

TABLE 8.31

Raw Scores (lbs.) Left Grip Test

Competitive Group A 14 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
C1	104	C14	96	C30	90	C45	90	C61	75
C2	70	C15	95	C31	95	C46	70	C62	100
C3	72	C17	100	C33	140	C47	100	C63	102
C4	80	C18	87	C34	90	C49	55	C65	90
C5	80	C20	60	C35	102	C51	70	C66	70
C6	68	C21	70	C36	90	C52	95	C67	82
C9	55	C25	75	C37	62	C54	85	C68	60
C10	50	C26	70	C38	75	C55	90	C69	75
C11	70	C27	70	C39	64	C56	104	C71	70
C12	95	C28	65	C42	100	C59	102	C72	100
C13	80	C29	70	C43	70	C60	100		

TABLE 8.32

Raw Scores (lbs.) Left Grip Test

Competitive Group B 14 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
C75	60	C91	80	C105	85	C118	70	C130	85
C76	98	C92	105	C106	60	C119	80	C131	65
C78	75	C93	90	C107	80	C120	100	C132	94
C79	70	C94	90	C108	75	C121	94	C133	70
C80	95	C95	65	C109	95	C122	84	C135	75
C81	72	C97	88	C110	60	C123	70	C136	60
C82	85	C98	72	C111	60	C124	92	C139	110
C83	75	C99	95	C112	90	C125	90	C140	70
C85	80	C101	65	C113	80	C126	90		
C88	75	C103	80	C115	85	C127	70		
C90	90	C104	96	C117	120	C128	102		

TABLE 8.33

Raw Scores (lbs.) Left Grip Test

Control Group A 12 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
N1	65	N14	30	N30	60	N45	80	N61	60
N2	50	N15	25	N31	50	N46	50	N62	75
N3	85	N17	65	N33	55	N47	70	N63	55
N4	30	N18	30	N34	40	N49	70	N65	45
N5	35	N20	55	N35	30	N51	65	N66	70
N6	35	N21	45	N36	20	N52	40	N67	25
N9	50	N25	50	N37	30	N54	62	N68	30
N10	45	N26	25	N38	45	N55	50	N69	55
N11	40	N27	50	N39	55	N56	75	N71	42
N12	60	N28	40	N42	55	N59	60	N72	50
N13	45	N29	45	N43	55	N60	40		

TABLE 8.34

Raw Scores (lbs.) Left Grip Test

Control Group B 12 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
N75	60	N91	50	N105	83	N118	60	N130	57
N76	50	N92	73	N106	35	N119	40	N131	45
N78	60	N93	60	N107	30	N120	30	N132	25
N79	41	N94	55	N108	40	N121	50	N133	20
N80	65	N95	40	N109	40	N122	45	N135	40
N81	75	N97	60	N110	65	N123	70	N136	50
N82	50	N98	65	N111	60	N124	45	N139	80
N83	35	N99	36	N112	70	N125	52	N140	55
N85	55	N101	25	N113	55	N126	65		
N88	50	N103	60	N115	50	N127	20		
N90	50	N104	50	N117	80	N128	57		

TABLE 8.35

Raw Scores (lbs.) Left Grip Test

Control Group A 13 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
N1	70	N14	60	N30	72	N45	100	N61	60
N2	65	N15	42	N31	55	N46	62	N62	60
N3	100	N17	100	N33	80	N47	98	N63	75
N4	55	N18	45	N34	42	N49	65	N65	55
N5	72	N20	60	N35	50	N51	85	N66	70
N6	44	N21	60	N36	70	N52	65	N67	55
N9	60	N25	60	N37	70	N54	80	N68	62
N10	70	N26	80	N38	62	N55	90	N69	78
N11	65	N27	70	N39	55	N56	100	N71	55
N12	75	N28	61	N42	65	N59	100	N72	60
N13	42	N29	70	N43	55	N60	58		

TABLE 8.36

Raw Scores (lbs.) Left Grip Test

Control Group B 13 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
N75	70	N91	50	N105	78	N118	65	N130	55
N76	73	N92	75	N106	35	N119	60	N131	65
N78	80	N93	85	N107	50	N120	42	N132	55
N79	42	N94	80	N108	58	N121	70	N133	30
N80	90	N95	45	N109	50	N122	55	N135	52
N81	70	N97	65	N110	80	N123	75	N136	50
N82	80	N98	80	N111	66	N124	58	N139	55
N83	50	N99	58	N112	65	N125	55	N140	58
N85	80	N101	45	N113	65	N126	62		
N88	40	N103	80	N115	55	N127	70		
N90	50	N104	60	N117	115	N128	55		

TABLE 8.37

Raw Scores (lbs.) Left Grip Test

Control Group A 14 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
N1	88	N14	60	N30	70	N45	100	N61	70
N2	70	N15	55	N31	55	N46	72	N62	80
N3	110	N17	100	N33	85	N47	100	N63	75
N4	60	N18	50	N34	60	N49	82	N65	65
N5	70	N20	80	N35	75	N51	90	N66	65
N6	50	N21	60	N36	90	N52	70	N67	60
N9	90	N25	60	N37	62	N54	90	N68	65
N10	60	N26	90	N38	60	N55	104	N69	80
N11	70	N27	68	N39	60	N56	104	N71	70
N12	84	N28	55	N42	70	N59	130	N72	65
N13	75	N29	80	N43	70	N60	85		

TABLE 8.38

Raw Scores (lbs.) Left Grip Test

Control Group B 14 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
N75	88	N91	65	N105	78	N118	75	N130	80
N76	90	N92	95	N106	50	N119	92	N131	70
N78	105	N93	112	N107	52	N120	50	N132	50
N79	60	N94	86	N108	70	N121	80	N133	50
N80	102	N95	60	N109	75	N122	55	N135	60
N81	100	N97	78	N110	80	N123	78	N136	80
N82	85	N98	96	N111	75	N124	88	N139	88
N83	60	N99	72	N112	70	N125	50	N140	78
N85	75	N101	60	N113	60	N126	70		
N88	60	N103	88	N115	50	N127	75		
N90	70	N104	70	N117	115	N128	65		

TABLE 8.39

Raw Scores (lbs.) Left Grip Test

Competitive Drop Outs 12 Years of Age

	lbs.		lbs.		lbs.		lbs.		lbs.
C7	50	C40	60	C53	55	C84	90	C102	60
C16	42	C41	35	C57	60	C87	55	C114	62
C19	30	C44	55	C64	25	C89	70	C116	45
C23	50	C48	50	C73	55	C96	70	C137	45
C32	60	C50	55	C74	65	C100	60	C138	55
								C141	50

TABLE 9.1

Matched Pairs Test Scores

Key

N Group Number
C = Competitors
N = Non competitors (Control)
A = Boys born in 1955
B = Boys born in 1956

Init Initials

DoB Date of Birth, Month and Year

I Intelligence Score

L Locality of home
D = Northumberland and Durham
Y = Yorkshire

Ed Type of Education
G = More academically biased
S = Less academically biased

RG Registrar General's Social Classes

TPS Total Proportional Strength in lbs.

N	Init	DoB	I	L	Ed	RG	TPS
C1A	DA	455	110	D	S	3	874
N1A	DW	1254	111	D	S	3	933
C2A	KA	555	118	D	S	3	773
N2A	SR	155	118	D	S	3	698
C3A	DA	755	127	Y	G	2	1105
N3A	JSF	855	127	Y	G	2	1201
C4A	PA	255	112	Y	S	2	754
N4A	PF	455	115	Y	S	3	733
C5A	JB	1155	97	Y	S	3	642
N5A	NC	955	95	D	S	3	685
C6A	CSB	855	111	Y	S	2	692
N6A	AB	755	113	Y	S	2	611
C9A	CAB	955	119	D	G	3	925
N9A	IL	955	119	D	G	3	805
C10A	JB	555	112	Y	S	2	709
N10A	RPT	655	111	Y	S	2	782

N	Init	DoB	I	L	Ed	RG	TPS
C1IA	NB	1255	127	Y	G	3	730
N1IA	WRP	755	129	Y	G	3	804
C12A	SHC	1255	124	D	G	2	888
N12A	SC	755	124	D	G	2	774
C13A	AC	155	128	D	G	3	574
N13A	NR	255	128	D	G	3	624
C14A	MC	955	120	D	G	2	681
N14A	PA	555	122	Y	G	2	654
C15A	JRD	955	96	D	S	3	1140
N15A	RH	555	97	D	S	3	1045
C17A	ND	155	115	Y	S	2	896
N17A	PJB	155	116	Y	S	2	914
C18A	DD	955	104	Y	S	3	829
N18A	AB	955	106	Y	S	3	742
C20A	TE	1255	114	D	S	3	673
N20A	JC	855	116	Y	S	2	684
C21A	CE	1255	99	Y	S	3	647
N21A	RW	1055	101	D	S	3	631
C25A	AG	1055	101	D	S	3	876
N25A	PA	156	101	D	S	3	857
C26A	TRG	1155	116	D	S	4	672
N26A	VB	655	118	D	S	4	682
C27A	JH	355	109	Y	S	4	687
N27A	PC	555	111	D	S	4	675
C28A	SMH	1055	117	Y	S	3	817
N28A	CB	655	118	Y	S	2	758
C29A	RDH	255	114	D	S	3	828
N29A	BN	1054	113	D	S	3	874
C30A	CMH	555	127	Y	G	3	744
N30A	RNH	655	126	Y	G	3	805
C31A	AHH	555	113	Y	G	1	731
N31A	SB	255	115	Y	G	2	702
C33A	MH	255	108	Y	G	2	1054
N33A	AC	155	108	Y	G	2	1011
C34A	SKJ	955	120	D	G	3	711
N34A	ARG	555	122	D	G	3	699

N	Init	DoB	I	L	Ed	RG	TPS
C35A	CJ	155	92	D	S	3	1214
N35A	DS	455	106	D	S	3	1121
C36A	GL	1055	116	Y	S	3	732
N36A	JB	655	116	D	S	3	746
C37A	NL	1055	93	D	S	4	935
N37A	GDH	256	95	D	S	4	893
C38A	DNM	755	113	D	G	1	694
N38A	MT	455	119	D	Gb	2	781
C39A	DM	1255	115	D	S	4	621
N39A	JH	855	115	D	S	4	636
C42A	AN	255	116	Y	S	4	1065
N42A	CJH	155	113	Y	S	4	957
C43A	PSO	455	115	Y	S	3	767
N43A	BL	555	113	Y	S	3	701
C45A	SP	555	114	D	S	3	910
N45A	JB	155	113	D	S	3	911
C46A	AEP	1055	122	Y	S	2	801
N46A	JSB	655	120	Y	S	2	846
C47A	MDP	455	132	D	G	2	864
N47A	SK	755	130	D	G	2	872
C49A	MR	555	114	D	S	3	800
N49A	HM	455	116	D	S	3	882
C51A	PAR	355	112	Y	G	3	797
N51A	BS	455	112	Y	G	3	765
C52A	JS	455	107	D	S	3	1025
N52A	DG	355	109	D	S	3	981
C54A	JJS	1255	101	D	G	3	838
N54A	JG	1055	102	D	G	3	910
C55A	HS	455	113	D	S	3	668
N55A	DC	355	115	D	S	3	661
C56A	TS	355	113	D	S	4	914
N56A	GG	655	114	D	S	4	957
C59A	AS	455	107	Y	S	3	869
N59A	RC	255	105	Y	S	3	900
C60A	JDT	455	121	Y	S	3	1012
N60A	RIC	355	119	Y	S	3	906

N	Init	DoB	I	L	Ed	RG	TPS
C61A	UT	355	131	D	G	3	780
N61A	CT	1254	129	D	G	3	685
C62A	PT	155	130	D	G	3	952
N62A	DS	455	126	D	G	3	938
C63A	ST	1055	116	Y	S	3	870
N63A	BJ	1055	114	Y	S	3	796
C65A	TAT	655	114	Y	S	3	768
N65A	JH	1055	116	D	S	3	702
C66A	WV	1055	115	D	G	2	1029
N66A	BJ	755	115	D	G	2	1008
C67A	KW	255	100	Y	S	3	800
N67A	PSK	355	102	Y	S	3	821
C68A	NU	555	118	Y	S	3	794
N68A	MEE	655	116	Y	S	3	844
C69A	TN	755	125	Y	G	3	742
N69A	TG	455	127	Y	G	3	806
C71A	IW	1155	122	D	G	2	503
N71A	KM	256	124	D	G	2	552
C72A	JM	355	102	Y	S	3	996
N72A	ST	755	104	D	S	3	908
C75B	JA	756	115	Y	G	2	844
N75B	DT	356	114	Y	G	2	774
C76B	JB	256	100	D	S	4	957
N76B	PO	456	102	D	S	4	940
C78B	DC	856	122	Y	G	2	796
N78B	KW	856	120	Y	G	2	890
C79B	KC	656	100	Y	S	3	847
N79B	PA	756	102	Y	S	3	835
C80B	JC	656	115	D	S	4	796
N80B	JS	256	114	D	S	4	894
C81B	RC	656	112	D	S	4	672
N81B	KH	656	113	D	S	4	705
C82B	JC	356	112	D	G	2	751
N82B	DB	856	114	D	G	2	696
C83B	BC	1256	108	D	S	3	623
N83B	JT	756	110	D	S	3	672

N	Init	DoB	I	L	Ed	RG	TPS
C85B	CD	456	124	D	S	3	764
N85B	JP	756	126	D	S	3	707
C88B	AD	656	101	Y	S	4	731
N88B	GC	356	103	Y	S	4	817
C90B	GE	656	115	D	G	2	798
N90B	JH	356	116	D	G	2	857
C91B	GE	556	106	D	S	3	853
N91B	IA	456	108	D	S	3	800
C92B	GF	756	110	Y	S	4	869
N92B	NH	556	111	Y	S	4	834
C93B	GRG	156	106	Y	S	3	845
N93B	RT	156	107	Y	S	3	881
C94B	VG	356	111	D	S	3	881
N94B	SC	456	109	D	S	3	965
C95B	AG	756	127	D	G	3	605
N95B	WC	256	126	D	G	3	659
C97B	SG	256	104	D	G	3	894
N97B	ST	1055	106	D	G	3	984
C98B	MH	1056	130	Y	G	2	762
N98B	PWE	656	132	Y	G	2	794
C99B	IH	356	119	D	S	3	751
N99B	EH	656	112	D	S	3	838
C101B	AH	356	111	D	S	2	716
N101B	ETB	456	109	D	S	2	662
C103B	TH	1156	122	D	G	4	876
N103B	SA	756	123	D	G	4	956
C104B	BH	1056	124	D	S	4	869
N104B	JA	756	126	D	S	4	885
C105B	JH	556	121	Y	S	3	910
N105B	JBC	556	122	Y	S	3	881
C106B	MDH	656	123	Y	G	2	698
N106B	CPO	856	120	Y	G	2	668
C107B	PH	556	110	D	S	3	688
N107B	RA	556	110	D	S	3	741
C108B	CH	1256	128	D	G	2	703
N108B	DP	856	128	D	G	2	706

N	Init	DoB	I	L	ED	RG	TPS
C109B	DH	656	105	D	S	3	754
N109B	MCR	956	103	D	S	3	785
C110B	VH	856	125	D	G	3	733
N110B	SLD	756	126	D	G	3	774
C111B	PH	556	121	D	S	3	757
N111B	LC	856	123	D	S	3	736
C112B	AK	156	120	Y	G	2	784
N112B	JGL	456	122	Y	G	2	713
C113B	DK	156	112	D	S	3	766
N113B	PK	456	114	D	S	3	709
C115B	PL	756	118	Y	S	3	837
N115B	SAB	556	116	Y	S	3	927
C117B	PL	356	117	D	S	2	934
N117B	TB	1155	115	D	S	2	916
C118B	JEM	556	116	Y	G	2	782
N118B	MC	356	114	Y	G	2	706
C119B	JM	256	83	D	S	4	900
N119B	SS	456	84	D	S	4	897
C120B	AM	756	125	D	S	2	966
N120B	KD	856	124	D	S	2	920
C121B	RM	356	121	Y	G	1	835
N121B	MCT	456	122	Y	G	2	806
C122B	KN	1156	109	D	S	3	766
N122B	RT	1256	111	D	S	3	759
C123B	EO	356	115	D	G	3	796
N123B	PC	356	117	D	G	2	865
C124B	CDP	156	119	Y	G	2	805
N124B	AGJ	556	117	Y	G	2	755
C125B	IQ	1156	127	Y	S	3	740
N125B	HH	956	125	Y	S	3	790
C126B	AJR	556	125	D	G	2	878
N126B	TB	156	123	D	G	2	919
C127B	PR	756	136	D	G	3	868
N127B	NT	356	138	D	G	3	952
C128B	IS	156	110	D	S	4	831
N128B	RI	156	110	D	S	4	887

N	Init	DoB	I	L	Ed	RG	TPS
C130B	SS	856	128	Y	S	3	868
N130B	ACW	756	126	Y	S	3	832
C131B	CJS	156	131	Y	G	3	631
N131B	TC	156	129	D	G	3	679
C132B	DS	956	108	D	S	2	688
N132B	RR	1056	106	D	S	2	635
C133B	JS	156	123	D	G	4	694
N133B	KN	456	124	D	G	4	755
C135B	RG	356	116	Y	S	3	819
N135B	RGR	1155	117	Y	S	3	794
C136B	AT	256	93	D	S	3	792
N136B	SG	356	92	D	S	3	851
C139B	DGW	1056	110	Y	G	2	770
N139B	MO	856	112	Y	G	2	845
C140B	PW	256	127	Y	G	2	758
N140B	BP	356	125	Y	G	2	745

TABLE 10.1

Composition of Competitive Sub Groups

Successful Competitors (SC) N = 35

4, 11, 14, 27, 28, 29, 33, 42, 43, 47, 52, 54, 55, 56, 59, 62, 63, 66, 76, 79, 80, 92, 93, 101, 108, 113, 117, 123, 124, 127, 130, 133, 135, 139, 140.

Unsuccessful Competitors (UC) N = 35

3, 9, 10, 21, 25, 26, 34, 35, 37, 38, 39, 45, 46, 49, 61, 67, 68, 71, 78, 83, 86, 90, 91, 94, 95, 97, 98, 103, 104, 110, 122, 125, 128, 129, 132.

Competitive Drop-Outs (CD) N = 26

7, 16, 19, 23, 32, 40, 41, 44, 48, 50, 53, 57, 64, 73, 74, 84, 87, 89, 96, 100, 102, 114, 116, 137, 138, 141.

Competitive Group Initial High Envia (CIHE) N = 17

29, 30, 33, 42, 47, 52, 59, 62, 66, 75, 85, 97, 98, 107, 110, 115, 118.

Competitive Group Initial Low Envia (CILE) N = 17

2, 4, 18, 25, 35, 51, 67, 71, 80, 91, 92, 99, 109, 121, 122, 128, 130.

Competitive Group Initial High Anxiety (CIHA) N = 17

10, 11, 17, 18, 20, 43, 65, 67, 78, 80, 91, 94, 103, 117, 122, 123, 131.

Competitive Group Initial Low Anxiety (CILA) N = 17

14, 29, 33, 45, 46, 52, 55, 66, 68, 72, 75, 82, 98, 110, 121, 126, 132.

Competitive Group Initial High Cortertia (CIHC) N = 17

3, 14, 51, 20, 21, 30, 34, 36, 42, 59, 76, 88, 97, 104, 105, 111, 132.

Competitive Group Initial Low Cortertia (CILC) N = 17

15, 26, 39, 45, 55, 65, 90, 95, 99, 108, 109, 113, 120, 121, 122, 126, 130.

Competitive Group Initial High Independence (CIHI) N = 17

10, 11, 25, 27, 29, 34, 54, 56, 66, 67, 78, 79, 80, 92, 104, 117, 135.

Competitive Group Initial Low Independence (CILI) N = 17

45, 46, 55, 75, 85, 95, 108, 115, 118, 119, 121, 122, 124, 125, 126, 130, 136.

Competitive Group High Extraversion-High Neuroticism (CHEHN)

N = 12

3, 5, 18, 20, 21, 39, 43, 59, 79, 123, 131, 135.

Competitive Group High Extraversion-Low Neuroticism (CHELN)

N = 17

1, 29, 30, 33, 34, 38, 47, 51, 52, 62, 82, 97, 101, 107, 113, 118, 126.

Competitive Group Low Extraversion-High Neuroticism (CLEHN)

N = 10

17, 69, 78, 80, 91, 92, 99, 106, 120, 128.

TABLE 1C.2

Composition of Control Sub Groups

Control Group Initial High Exvia (NIHE) N = 17

3, 9, 15, 17, 18, 21, 27, 42, 46, 90, 92, 118, 121, 123, 125, 131, 139.

Control Group Initial Low Exvia (NILE) N = 17

10, 11, 12, 20, 39, 55, 65, 66, 71, 79, 82, 91, 95, 107, 109, 110, 128.

Control Group Initial High Anxiety (NIHA) N = 17

6, 11, 20, 30, 46, 49, 60, 65, 66, 67, 76, 82, 83, 91, 99, 112, 113.

Control Group Initial Low Anxiety (NILA) N = 17

1, 17, 26, 27, 29, 35, 52, 59, 61, 69, 72, 75, 98, 106, 110, 118, 128.

Control Group Initial High Cortertia (NIHC) N = 17

3, 5, 6, 9, 18, 30, 33, 35, 42, 46, 92, 93, 97, 107, 118, 122, 125.

Control Group Initial Low Cortertia (NILC) N = 17

4, 36, 38, 43, 47, 55, 61, 65, 66, 79, 82, 91, 104, 106, 109, 110, 128.

Control Group Initial High Independence (NIHI) N = 17

2, 11, 27, 31, 42, 60, 63, 68, 76, 78, 83, 91, 97, 98, 99, 109, 115.

Control Group Initial Low Independence (NILI) N = 17

1, 6, 12, 13, 17, 47, 92, 94, 104, 110, 118, 124, 127, 128, 131, 135, 136.

Control Group High Extraversion-High Neuroticism (NHEHN) N = 7

34, 42, 46, 68, 72, 76, 139.

Control Group High Extraversion-Low Neuroticism (NHELN) N = 12

3, 17, 18, 27, 29, 43, 45, 47, 52, 132, 135, 140.

Control Group Low Extraversion-High Neuroticism (NLEHN) N = 10

2, 51, 65, 79, 81, 91, 88, 106, 117, 126.

TABLE 11.1

Weights and Constants to apply to HSPQ Primary Factor Stens to obtain Second Order Factor Stens (Boys)[1]

Primary Factors	Exvia	Anxiety	Cortertia	Independence
A	.4		-.3	-.1
B	-.1	-.1	-.1	
C	.1	-.2	.2	.1
D		.2	-.1	.3
E	.4	-.1	.4	.4
F	.4	.1	.1	.1
G		-.2	-.2	-.1
H	.4	-.2	.3	-.1
I	-.1		-.2	
J				.3
O	-.2	.3		.3
Q_2	-.1	-.2		.2
Q_3	-.1	-.3	-.4	.3
Q_4	.1	.1	.1	.2
Constant	-1.1	7.7	6.6	-5.0

[1] Raymond B. Cattell and Mary D.L. Cattell, Handbook for the Jr-Sr. High School Personality Questionnaire, Champaign, Illinois, Institute For Personality and Ability Testing, 1969, p.41.

High School Personality Questionnaire[1,2] (also 16PF)[3,4]

Psychological Meaning of Primary Source Traits

FACTOR A

Low Score		High Score
SIZOTHYMIA, A- (Aloof, stiff)	versus	AFFECTOTHYMIA, A+ (Warm, sociable)
Critical	v	Good natured, Easy going
Stands by his own ideas	v	Ready to co-operate, Likes to participate
Cool, aloof	v	Attentive to people
Precise objective	v	Soft-hearted, casual
Distrustful, sceptical	v	Trustful
Rigid	v	Adaptable, careless
Cold	v	Warm hearted
Prone to sulk	v	Readily laughs

The most consistent features of affectothymia A+ are easy going, accessible emotions and interest in people. In contrast the sizothymia A- person is more uncompromising and earnest, prefers things and words to people and likes working alone. The affectothyme is generally found to have superior social adjustments in school.

Cattell, Blewitt and Beloff[5] found that there is evidence of substantial hereditary determination of this factor.

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[1]Raymond B.Cattell and Mary D.L.Cattell, Handbook for the High School Personality Questionnaire, Champaign, Illinois, Institute for Personality and Ability Testing, 1969, pp.26-35.

[2]Raymond B.Cattell, The Scientific Analysis of Personality, Harmondsworth, Penguin Books, 1965, pp.62-102.

[3]Raymond B.Cattell, Personality and Motivation Structure and Measurement, New York World Book Co., 1957, pp.90-224.

[4]Raymond B.Cattell, H.W.Eber and M.M.Tatsuoka, Handbook for the Sixteen Personality Factor Questionnaire, Champaign, Illinois, Institute for Personality and Ability Testing, 1970, pp.80-109.

[5]R.B.Cattell, D.B.Blewett and H.Beloff, "The Inheritance of Personality: A Multiple Variance Analysis Determination of Approximate Nature-nurture Ratios for Primary Personality Factors in Q-data", American Journal Human Genetics 7:2, (June 1955), pp.122-146.

FACTOR B

Low Score		High Score
LOW INTELLIGENCE, B- (Dull)	versus	HIGH INTELLIGENCE, B+ (Bright)
Low mental capacity	v	High general mental capacity
Unable to handle abstract problems	v	Insightful, Fast learning, Intellectually adaptable

The measurement of intelligence has been shown to carry with it as a factor in the personality realm some of the following rating.

Apt to be less well organised	v	Inclined to have more intellectual interests

These associations are not very highly loaded (.3 to .4). Cattell and Cattell[1] point out that the principal object of measuring Factor B is not to add to personality information but to complete the measurement of factors important in most school and clinic predictions. They classify it as a general ability measure but suggest the use of longer intelligence tests when greater reliability is required. Furthermore they indicate that Factor B would not be expected to correlate perfectly with the average intelligence test due to brevity of the former and the fact that the latter is usually given under speeded conditions.

FACTOR C

Low Score		High Score
EMOTIONAL INSTABILITY or EGO WEAKNESS, C- (Emotional, Immature, Unstable, Easily upset)	versus	EGO STRENGTH, C+ (Emotionally stable, Mature, calm)
Gets emotional when frustrated	v	Emotionally mature
Changeable in attitudes and interests	v	Stable, constant in interests
Easily perturbed	v	Calm
Evasive of responsibilities	v	Realistic, adjusts to facts
Worrying	v	Unruffled
Gets into fights and accidents	v	Shows restraint in avoiding difficulties

Ego strength is commonly regarded as a factor expressing the degree of achievement of dynamic integration and emotional control - the success of emotional learning. The person displaying Ego weakness tends to be easily annoyed by things and persons, is often more dissatisfied and has difficulty in restraining himself. He tends to show more than average

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[1] Cattell and Cattell, op.cit., p.28.

neurotic responses. He may fail in adjustment particularly under stressful situations. In contrast a person with high Ego strength is more calm, placid and satisfied. He is a more integrated person more able to control emotional impulses.

Constitutional factors appear to make acquisition of emotional control and steadiness harder for some than others. However, environmental factors are about three times more important than hereditary factors between families and possibly ten times as important within families.

FACTOR D

Low Score		High Score
PHLEGMATIC TEMPERAMENT D- (Undemonstrative, Deliberate, Inactive)	versus v	EXCITABILITY, D+ (Excitable, Impatient, Demanding, Overactive, Unrestrained)
Stoic	v	Demanding, Impatient
Complacent	v	Attention getting, Showing off
Deliberate	v	Excitable, overactive
Not easily jealous	v	Prone to jealousy
Self-effacing	v	Self-assertive, egotistical
Constant	v	Distractable
Not restless	v	Shows many nervous symptoms

This factor has certain behaviour similarities to Factor C but is distinguished from the latter by the more immediate temperamental quality of the excitability. (Factor C - expresses a specifically poor emotional control, without excitement being central.) It is a factor which shows as a substantial dimension in children.

The excitable individual is restless, easily distracted, impatient and tends to 'show off'. In contrast the individual of phlegmatic temperament is more placid and dependable.

It would appear that environmental and hereditary factors are about equally important. There is appreciable hereditary determination between families but environmental factors play a large role within families, the latter being particularly associated with deprivation of accustomed affection and support.

There is a negative correlation of this factor with age.

FACTOR E

Low Score		High Score
SUBMISSIVENESS, E- (Obedient, mild, easily led, docile, accommodating)	versus	DOMINANCE, E+ (Assertive, aggressive, competitive, stubborn)
Submissive	v	Assertive, self-assured
Dependent	v	Independent-minded
Considerate, diplomatic	v	Stern, hostile
Expressive	v	Solemn
Conventional, conforming	v	Unconventional, Rebellious
Easily upset by authority	v	Headstrong
Humble	v	Admiration demanding

High dominance may lead to disobedience and possibly anti-social behaviour. However this can often be controlled and in sublimated form the trait cannot be regarded as detrimental. Independence of thought and high performance in sport are associated with dominance. Groups in which all members are on the high side in dominance show more effective role interaction and more truly individualistic democratic procedure, group problems being readily raised and group defects being readily criticised.

There is considerable hereditary determination of this factor between families but also marked environmental determination of individuals within families - nature-nurture wise it is a half and half factor.

FACTOR F

Low Score		High Score
DESURGENCY, F- (Sober, serious, taciturn)	versus	SURGENCY, F+ (Enthusiastic, happy-go-lucky, heedless)
Silent, introspective	v	Talkative
Full of cares	v	Cheerful
Concerned, reflective	v	Happy-go-lucky
Incommunicative, sticks to inner values	v	Frank, expressive, reflects the group
Slow, deliberate	v	Quick, alert

This is one of the most important components in second order extroversion. In children and in adolescents it appears to be the largest single primary factor in personality. Surgency shows a downward age trend after adolescence with a steep drop between 17-35, followed by a less steep downward trend.

Surgency has been found to be significantly associated with initial choice as a leader in new groups and with the number of persons known. Associations of surgency with sociometric popularity and success in an immediate group,

but with lower performance in long term serious undertakings is consistently found. Desurgent children are not particularly popular with peers and are not usually leaders of groups but their seriousness about any work tends to promote occupational success throughout life.

Surgency has a largely environmentally determined variance; high surgency having significant associations with comfortable rather indulgent homes and a more optimism-creating environment. Desurgent individuals have generally been brought up with more severe sobering standards. There is in addition a significant relation to family position, the oldest tend to be more desurgent and the youngest more surgent.

Desurgency may also be a consequence of some tendency of the individual to make his environment more difficult by taking on more long term goals and responsibilities.

FACTOR G

Low Score		High Score
LOW SUPER EGO STRENGTH or LACK OF ACCEPTANCE OF GROUP MORAL STANDARDS, G- (Disregards rules, expedient)	versus	SUPER EGO STRENGTH OR CHARACTER, G+ (Conscientious, persistent, moralistic, staid)
Quitting, fickle	v	Persevering, determined
Frivolous	v	Responsible
Self-indulgent	v	Emotionally disciplined
Slack, indolent	v	Consistently ordered
Undependable	v	Conscientious, dominated by sense of duty
Disregards obligations to people	v	Concerned about moral standards and rules

This factor shows resemblance to Factor C, the difference between the two being perceptible mainly in the greater loading of G on perseverence, conscientiousness and responsibility and of C in emotional stability. Factor G is characterised most by energy and persistence and with regard for moral standards.

Subjectively the G+ person considers himself to be correct in, and a guardian of manners and morals. The high factor G+ person is likely to achieve success in performances requiring persistence, have high achievement, be popular and a leader in school, and achieve occupational success later.

Slow Super Ego strength is a central feature of the delinquent profile and is characterised by lying, showing off, stealing, destruction, and defiance of law and order.

The existing evidence suggests a large environmental influence - as might be expected in a socially moulded trait.

FACTOR H

Low Score		High Score
THRECTIA, H- (Shy, timid, threat-sensitive, restrained)	versus	PARMIA, H+ (Adventurous, socially bold)
Shy, withdrawn	v	Adventurous, likes meeting people
Retiring in face of opposite sex	v	Active, overt interest in opposite sex
Socially cautious	v	Responsive, genial
Apt to be embittered	v	Friendly
Restrained, rule bound	v	Impulsive
Restricted interests	v	Emotional and artistic interests
Careful, considerate, quick to see dangers	v	Carefree, does not see danger signals

This factor shows resemblance to both A and F. It is however readily distinguished from A by the boldness versus shyness present in H and by absence of flexibility - rigidity. It is distinguished from F by the more adventurous, warm, kindly dynamic quality of H in contrast to the talkative, witty limelighting quality of F.

The high H+ person is characterised by boldness but is distinguishable from dominance by lack of drive and by presence of emotional incontinence and casualness.

The H- person shows withdrawn careful characteristics, is shy yet considerate of other persons sensitivities.

Present evidence shows factor H to have the highest hereditary determination of any, and is substantially a constitutional factor being connected with threat-reactivity of the autonomic nervous system.

The term "threctia" for H- is an abbreviation for "threat responsiveness" whilst "parmia" for H+ is an abbreviation for "parasympathetic predominance".

FACTOR I

Low Score		High Score
HARRIA, I- (Tough, realistic)	versus	PRESMIA, I+ (Tender minded, sensitive, dependent, overprotected)
Realistic, expects little	v	Demanding, impatient, expecting attention
Self-reliant, taking responsibility	v	Insecure, seeking help and sympathy
Hard	v	Kindly, gentle, indulgent to self and others
Few artistic responses but not lacking in taste	v	Artistically fastidious, affected, theatrical

Unaffected by fancies	v	Imaginative, introspective
Acts on practical logical evidence	v	Acts on sensitive intuition
Keeps to the point	v	Attention seeking
Free from hypochondria	v	Hypochondriacal

Persons high on Factor I+ tend to avoid rough and adventurous situations, to be dependent, and demanding of attention and to be of tender disposition, lacking in realism. The I- person represents a sort of tough masculine, practical, realistic, self-reliant individual.

Evidence indicates that this is one of the most environmentally influenced factors with both family background and culture playing important roles. Presmia/ Harria is basically a dimension of over-protection or indulgence as opposed to exposure to hard realities.

The term "presmia" for I+ is an abbreviation for "protected emotional sensitivity", whilst "harria" for I- is an abbreviation for "hardness and realism".

FACTOR J

Low Score		High Score
ZEPPIA, J-	versus	COASTHENIA, J+
(Zestful, liking group action)		(Circumspect, individualism, reflective, internally restrained)
Likes to go with the group	v	Acts individualistically
Likes attention	v	Guarded, wrapped up in self
Sinks personality into group enterprise	v	Fastidiously obstructive
Vigorous	v	Neurathenically fatigued
Accepts common standards	v	Evaluates coldly

Persons high on Factor J+ prefer to do things on their own, are meticulous, lack zest and have an individualistic assertion of the self within a framework of reasoning, partly motivated by negatism. The J- person tends to uncritical zestful acceptance of group activity.

The evidence available places this factor in the middle of the more environmental and more hereditary patterns. There appears to be a 10:1 hereditary predominance between family variance and a 2:1 environmental predominance within families. The pattern has the stamp of a more cultured home where one would find thinking and reasoning and an indirectness of conflict.

The terms "Coasthenia" and "Zeppia" are condensed forms from the descriptive meanings "Cultured Pressure Conflict Asthenia" versus "Zestful Co-operativeness".

Coasthenia well designates the common aesthetic core in neurasthenia and psychasthenia which this factor seems to be. The person who shows this pattern through cultural standards being brought to bear too early and too powerfully is said to be coasthenic and the less tutored person is said to be zeppic.

FACTOR O

Low Score		High Score
UNTROUBLED ADEQUACY, O- (Self-assured, placid, secure, complacent, serence)	v	GUILT PRONENESS, O+ (Apprehensive, self-reproaching, insecure, worrying, troubled)
Self-confident	v	Worrying, anxious
Cheerful, resilient	v	Depressed, cries easily
Impenitent, placid	v	Easily touched, overcome by moods
Expedient, Insensitive to people's approval or disapproval	v	Strong sense of obligation, sensitive to people's approval and disapproval
Does not care	v	Scrupulous, fussy
Rudely vigorous	v	Hypochondrical and inadequate
No fears	v	Phobic symptoms
Given to simple action	v	Lonely, brooding

The essential features of this factor are timidity and a sense of inadequacy with a tendency to moral behaviour. The person high on O+ tends to feel inadequate to meet the rough daily demands of life, and is easily downhearted and is remorseful. They tend to be unpopular with peers - socially maladjusted.

The factor is labelled "Guilt Proneness" and on present evidence it is not possible to determine whether it is basically a dispositional trait which, though predominantly timidity, has despair and abasement associated; or the result of an environmental influence of a sensitive deeply affectionate relation to the parent, which has made later adjustments to a rougher world difficult.

FACTOR Q_2

Low Score		High Score
GROUP DEPENDENCY, Q_2- (Sociably Group Dependent)	versus	SELF-SUFFICIENCY, Q_2+ (Self-sufficient, resourceful, prefers own decisions)

This factor in common with the two other Q factors is not clearly established in external behaviour ratings made by observers, showing itself more in internal ratings.

It is one of the major factors of second order introversion.

The Q_2+ is resolute and used to making decisions for himself whilst the Q_2- person is one who goes with the group, definitely values social approval more, and is conventional and fashionable.

Children high in Q_2 tend to have developed early and to be mature for their age. The factor is essentially a maturity in reasoning and perhaps in emotion, beginning early in childhood. Evidence of nature-nurture origin is lacking but one might reasonably expect this factor which could be termed "thinking introversion" to be a pattern passed on in an educated family tradition, but perhaps requiring some inherited emotional stability for its successful development.

(Ratings of behaviour characteristics are not given for this factor nor for Q_3 nor Q_4 since as indicated these three have been found for certain only in the realm of questionnaire responses - hence their designation as "Q factors".)

FACTOR Q_3

Low Score		High Score
LOW SELF-SENTIMENT, INTEGRATION, Q_3- (Uncontrolled, lax)	versus	HIGH STRENGTH OF SELF-SENTIMENT, Q_3+ (Controlled, exacting, will power)

The person high on Factor Q_3 tends to be one who is self-controlled, strives to accept approved ethical standards, is ambitious to do well, considerate of others, foresighted, disposed to reduce and control expressions of emotion, is conscientious and is likely to be chosen as a leader. The person low on Q_3 typically displays uncontrolled emotionality, excitability and a rejection of cultural demands - some resemblance to Factor D.

Factor Q_3 expresses the degree to which the individual has adopted an ideal self regarding sentiment by which to direct his behaviour. Indications are that environment has about an 8:1 ratio to heredity in determining individual levels on this source trait. Similarly there are indications that its growth can be stimulated by direct, constructive education in values and encouragement in self-respect.

In interpreting Q_3 it is necessary to distinguish it from Factors C, ego strength, and G, super ego strength, which belong to the same class of character or integration factors. C is a more massive and less self conscious stability and integration whilst G stresses the striving for basic morals whereas Q_3 stresses self-assured manners, morals, reputation and self-control. Q_3- is central to the second order factor of anxiety.

FACTOR Q_4

Low Score		High Score
LOW ERGIC TENSION, Q_4- (Relaxed, tranquil, torpid, unfrustrated, composed)	versus	HIGH ERGIC TENSION, Q_4+ (Tense, frustrated, driven, overwrought, fretful)

Persons scoring high on this factor describe themselves as irrationally worried, tense, irritable and in turmoil. Children feel frustrated, and are aware of being criticised by parents for untidiness, fantasy and neglect of good goals.

There is some superficial resemblance to Factor D but actual correlation connections exist rather with C- ego weakness and O+ guilt proneness. These three factors indeed contribute to second order factor anxiety.

There appears to be greater hereditary as compared to environmental influence between families but within families environment is about four times as contributory to Q_4.

The factor may broadly be considered to represent a level of excitement and tension due to undischarged drive (frustration).

The Nature of Higher Order Personality Factors Measured By H.S.P.Q. and J.E.P.I.

Cattell H.S.P.Q.

1. Exvia-Invia

This is described in the handbook for the test[1] as being a general tendency towards social interaction - exvia, as opposed to a general inhibitedness in all respects of social interaction - invia. The factor predicts the child's seeking or avoiding social interaction. Primary factors which have high contributions to exvia are A - Affectothymia, E - Dominance, F - Surgency, and H - Parmia. There is close resemblance between primary factor content of exvia in children and in adults.

2. Anxiety

Cattell and Cattell[2] state that this source trait has the usual meaning of anxiety with close relations to clinical symptoms and close agreement with psychiatric ratings. The child with a high level of Anxiety would exhibit troubled or uneasy responses particularly with regard to something doubtful or something in the future. The two primary factors with highest loadings on Anxiety are O - Guilt Proneness, Q_3 - - Low Self Sentiment Integration. Cattell[3] has stated that whilst 2nd order Anxiety in children corresponds closely to that in adults in respect to certain primary factors, there are however some systematic differences which suggest that the anxiety factor in children is less concerned with internal conflict due to defects in personality integration but more with situational threat, clash with authority and low or late adoption of super ego standards.

3. Cortertia - Pathemia

Cortertia is a shortened form of "cortical alertness" and expresses the activation level of a child - cortical alertness and energy. Pathemia is at the other end of the continuum and means "proneness to feeling reaction", individuals low on this factor living at a level of accepted frustration - depression. High Cortertia is associated with success, e.g. in scholastic attainment. Low Cortertia is associated with depressive emotion and frustration. Primary factors with high contributions to Cortertia include E - Dominance and H - Parmia positively and A - Affectothymia and Q_3 Self Sentiment negatively.

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[1] Cattell and Cattell, op.cit., p.38.

[2] Loc.cit.

[3] R.B. Cattell, "Anxiety, Extraversion and other Second Order Personality Factors in Children", Journal of Personality [illegible]

Following each of the main analyses of the four H.S.P.Q. second order factors, i.e. those comparing Competitive and Control groups A, B and C, analyses are made for Competitive and Control groups who initially scored high or low on the factor. Tables 5.17, 5.18; 5.20, 5.21; 5.23, 5.24; 5.26, 5.27; in the Appendix list the means, standard deviations, F ratios and significance levels for these comparisons in the order High Emvia, Low Emvia, High Anxiety, Low Anxiety, High Cortertia, Low Cortertia, High Independence, Low Independence.

As indicated in Chapter 3 these groups comprised those subjects whose initial score on a factor was above or below one standard deviation from the mean score of their group on the factor. This is 31.74% of the total groups since in a normal distribution 68.26% of the population fall within the limits of $\pm$ one standard deviation from the mean. Accordingly with total populations of 166 these groups consist of 17 subjects with initially the highest or lowest scores. When the scores were checked it was found that on all the second order variables the number of subjects who were beyond one standard deviation from the mean in both directions corresponded closely with the expected 17 per group. This indicated that the distribution of scores for both groups on these variables was near normal.

Such analyses may be influenced by a regression effect, the initially high and low scores tending to regress towards the mean.[1] In analyses where the level of a factor remained unchanged or where the trend proved to be in the opposite direction, such regression effects have been negated and changes

[illegible]

[illegible] University of London Press, 1961, p.38.

4. Independence

This source trait indicates levels of criticalness of judgement, precision and exactitude of performance, masculine aggressiveness and creativity. There is some suggestion of an association with ability to maintain "field independence" in perception although Cattell[1] has recommended further research into this relationship.[2] Cattell and Cattell state that the level of Independence is appreciably fixed in early life and by heredity.

Eysenck J.E.P.I.

1. Extraversion-Introversion

Sybil Eysenck[3] states that extraversion is characterised by sociability, activity, optimism, outgoing and impulsive behaviour; introversion is characterised by unsociable, passive, quiet, thoughtful and reserved behaviour.

Eysenck[4] following a brief review of descriptions of extraverts and introverts concluded that there was some measure of agreement that the introvert has a more subjective outlook, a higher degree of cerebral activity and a tendency to self control (inhibition) whilst the extravert has a more objective outlook, a higher degree of behavioural activity and a tendency to lack self control.

Eysenck and Eysenck[5] have described typical reactions of extraverts and introverts in terms of excitation - facilitation of cortical events underlying perceptual learning and motor movement phenomena, and of inhibition - the depression of these phenomena. They have linked introversion with ease of formation of conditioned responses and stated that introverts perform better on vigilance tests, have longer after images, preserve visual fixation better, show less satiation - weaker figural after effects,

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[1] Raymond B.Cattell, "Is Field Independence an Expression of the General Personality Source Trait of Independence?" Perceptual and Motor Skills 28, 1969, pp.855-856.

[2] Cattell and Cattell, Op.cit., p.39.

[3] Sybil B.G.Eysenck, Manual of the Junior Eysenck Personality Inventory, London, University of London Press, 1965, p.3.

[4] H.J.Eysenck, Dimensions of Personality, London, Routledge and Kegan Paul, 1947, pp.56-58.

[5] H.J.Eysenck and S.B.Eysenck, Personality Structure and Measurement, London, Routledge, 1969, pp.50-52.

have greater tolerance for sensory deprivation but less tolerance of physical pain. They have linked excitation - inhibition with the ascending reticular formation.

"Introverts are characterised by a reticular formation the activating part of which has a relatively low threshold of arousal while the recruiting part of it has a high threshold of arousal, conversely extraverts are characterised by their possession of a reticular formation whose activating part has a high threshold of arousal and whose recruiting (synchronising) part has a low threshold of arousal. Under identical conditions therefore cortical arousal will be more marked in introverts and cortical inhibition in extraverts."

2. Neuroticism

Sybil Eysenck[1] states that the unstable person is moody, touchy, anxious, restless, rigid, whilst the stable person is calm, carefree, easy going and reliable.

Eysenck and Prell[2] reported a study from the results of which they concluded that predisposition to neuroticism is to a large extent attributable to heredity. Later Eysenck and Eysenck[3] stated that changes of scores on the Neuroticism factor are affected by events happening to the persons concerned.

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[1] Sybil B.G. Eysenck, loc.cit.

[2] H.J. Eysenck and D.B. Prese "The Inheritance of Neuroticism - An Experimental Study", Journal Mental Science 97, 1951, pp.461-462.

[3] Eysenck and Eysenck, Op.cit., p.61.

California Psychological Inventory[1]

Class I Measures of Poise, Ascendancy and Self Assurance

1. Do (Dominance) To assess factors of leadership ability, dominance, persistence and social initiative.
2. Cs (Capacity for status) To serve as an index of an individual's capacity for status (not his actual or achieved status). The scale attempts to measure the personal qualities and attributes which underlie and lead to status.
3. Sy (Sociability) To identify persons of outgoing sociable participative temperament.
4. Sp (Social pre-service) To assess factors such as poise, spontaneity, and self confidence in personal and social interaction.
5. Sa (Self acceptance) To assess factors such as a sense of personal worth, self acceptance and capacity for independent thinking and action.
6. Wo (Sense of well being) To identify persons who manage their worries and complaints, and are relatively free from self doubt and disillusionment.

Class II Measures of Socialisation, Maturity and Responsibility

7. Re (Responsibility) To identify persons of conscientious responsible and dependable disposition and temperament.
8. So (Socialisation) To indicate the degree of social maturity, integrity and rectitude which the individual has attained.
9. Sc (Self control) To assess the degree and adequacy of self regulation and self control and freedom from impulsivity and self centredness.
10. To (Tolerance) To identify people with permissive, accepting and non judgemental social belief and attitudes.
11. Gi (Good impression) To identify persons capable of creating a favourable impression and who are concerned with how others react to them.
12. Cm (Community) To indicate the degree to which an individual's reactions and responses correspond to the model ("common") pattern established for the inventory.

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[1] Harrison G. Gough, Manual for the California Psychological Inventory, Palo Alto Cal. Consulting Psychologists Press Inc., 1957, pp. 10-11.

Class III Measures of Achievement Potential and Intellectual Efficiency

13. Ac (Achievement via conformance) To identify those factors of interest and motivation which facilitate achievement in any setting where conformance is a positive behaviour.

14. A (Achievement via independence) To identify those factors of interest and motivation which facilitate achievement in any setting where autonomy and independence are positive behaviours.

15. ie (Intellectual efficiency) To indicate the degree of personal and intellectual efficiency which the individual has attained.

Class IV Measures of Intellectual and Interest Modes

16. Py (Psychological mindedness) To measure the degree to which the individual is interested in and responsive to the inner needs, motives and experience of others.

17. Fx (Flexibility) To indicate the degree of flexibility and adequatability of a person's standing and social behaviour.

18. Fe (Femininity) To assess the masculinity or femininity of interests. (High scores indicate more feminine interests.)

Minnesota Multiphasic Personality Inventory[1]

K Score. Suppressor Scale - a correction factor to sharpen the discriminatory power of the variables measured by the inventory. Thus the K score acts as a suppressor variable.

Hs (Hypochondriasis) a measure of the amount of abnormal concern about bodily functions. Persons with high scores are unduly worried about their health. They frequently complain of pain and disorders which are difficult to identify and for which no clear organic basis can be found. It is characteristic of the hypochondriac that he is immature in his approach to adult problems, tending to fail to respond with adequate insight.

D (Depression) measures the depth of clinically recognised symptoms or symptom complex of depression. The depression may be the chief symptom of the subject, or it may accompany, or be the result of other personality problems. A high D score indicates poor morale of the emotional type with a feeling of uselessness and with an inability to assume a normal optimism with regard to the future. A high score further suggests a characteristic personality background in that the person who reacts to stress with depression is characterised by a lack of self-confidence or tendency to worry, narrowness of interest and introversion.

Hy (Hysteria) measures the degree to which the subject is like patients who have developed conversion-type hysteria symptoms. Definite symptoms may never appear in a person with a high score, but under stress he is likely to become overtly hysterical and solve the problems confronting him by the development of symptoms.

Pd (Psychopathic deviate) measures the similarity of the subject to a group of persons whose main difficulty lies in their lack of deep emotional response, their inability to profit from experience and their disregard for social mores.

Mf (Interest masculine/feminine) measures the tendency towards masculine or femininity of interest pattern. A high score indicates a deviation of the basic interest in the direction of the opposite sex.

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[1] S.R.Hathaway and J.C.McKinley, Minnesota Multiphasic Personality Inventory Manual, New York. Psychological Corporation, 1951.

Pa (Paranonia) contrasts normal persons with patients who with or without expansive egotism were characterised by suspiciousness, over-sensitivity, and delusions of persecution.

Pt (Psychoasthenia) measures the similarity of the subject to psychiatric patients who are troubled by phobias or compulsive behaviour. The phobias include all types of unreasonable fear of things or situations as well as an overreaction to more reasonable stimuli. Frequently a psychoasthenic may be manifested merely in a mild depression, in excessive worry, and in lack of confidence or in an inability to concentrate.

Sc (Schizophrenia) measures the similarity of the subject responses to those patients who are characterised by bizarre and unusual thoughts or behaviour. There is a splitting of the subjective life of the schizophrenic person so that the observer cannot follow rationally the shifts in mood or behaviour.

Ma (Hypomania) measures the personality factor characteristic of persons with marked overproductivity in thought and action. The word hypomania refers to a lesser state of mania. The hypomanic patient has usually got into trouble because of undertaking too many things. He is active and enthusiastic. Contrary to common expectations he may also be somewhat depressed at times.

Si (Social intraversion-extroversion) aims to measure the tendency to withdraw from social contact with others.

A (Manifest anxiety) indicates the level of internal anxiety or emotionality of the individual.

Do (Dominance) the dominant person is able to influence others, to gain their automatic respect and if necessary to control them. He is not readily intimidated or defeated and his own feelings in most face to face situations seem to be feelings of safety, security, personal rightness and self confidence.

Re (Social responsibility) indicates the responsible person who is the one who shows a ready willingness to accept the consequence of his own behaviour, dependability, trustworthiness and a sense of obligation to the group.

The Autonomic Nervous System[1]

The terms "sympathetic" and "parasympathetic" used in Chapter 1 refer to the double nerve supply of the autonomic system. The system is the nerve supply to the internal organs and blood vessels of the body and is not under conscious control. The action of the system is however affected by emotions.

The two sets of nerves are antagonistic in action. The sympathetic have a stimulating effect on the circulatory and respiratory systems but a checking effect on the digestive system. They enable the body to respond, e.g. to threat through an increased supply of oxygen rich blood to the muscles. The parasympathetic system in contrast stimulates the digestive system but slows down the circulatory and respiratory systems. Where there is imbalance in the body between the two sets of nervous action certain behavioural characteristics are likely to be shown as suggested by Cureton (pp. 17-18).

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[1] R.D.Lockhart, G.F.Hamilton and F.W.Fyfe, Anatomy of the Human Body, London, Faber & Faber, 1959, pp.322-343.

Galvanic Skin Response Test[1]

This is a test of one of the physiological responses to changes in the emotional state of an individual. The response measured is the resistance of the skin to the flow of electric current. During some emotional states the sweat glands of the palms become active and offer greater resistance to a current passed through the skin. The resistance is measurable and is known as the galvanic skin response.

A measure such as this does not measure emotional response per se. It is a measure of physiological response which is suggestive of concomitant emotional excitation.

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[1]Elvera Skubic, "Emotional Responses of Boys to Competitive Baseball", Research Quarterly, 26:3, October, 1955, p.350.

High School Personality Questionnaire[1]

Test Administration

The test booklets and answer sheets are handed out to the children and the following instructions are given:

"Put your answer sheet beside the booklet and write your name, age, school and today's date in the spaces indicated."

"Now follow the 'what to do' section on the cover of the booklet while I read it aloud."

The examiner reads this aloud, pausing to remind the examinees to answer the examples. After the instructions are read and the examples are completed he says:

"Do you have any questions about these instructions."

Having dealt fully with any questions, the examiner says:

"Open the booklet and start at Number 1. Be sure you mark in the box or space for question number 1 on the answer sheet. Continue with one question after another, marking your answer to each question on the answer sheet. Be sure you mark the box or space by the same number on the answer sheet as the number of the question you are answering in the booklet. Give one answer to every question. Answer every question."

Reminders are given after 10, 20 and 30 minutes that the children should be approximately at least up to questions 35, 70 and 105 respectively.

At the end of the test the main point to make is:

"Look back over your answer sheet and make quite sure before you hand it in that you have answered every question."

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[1]Raymond B.Cattell, Manual for the High School Personality Questionnaire, Champaign, Illinois, Institute for Personality and Ability Testing, pp.5-8.

Junior Eysenck Personality Inventory[1]

Test Administration

The test papers are handed out to the children who are asked to write their names, age and sex in the spaces indicated.

The following instructions are then given:

"Here are some questions about the way you behave, feel and act. After each question is a space for answering YES or NO.

Try to decide whether YES or NO is your usual way of acting or feeling. Then put a cross in the circle under the column headed YES or NO. Work quickly and don't spend too much time over any question. Be sure not to leave out any questions."

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[1]Sybil B.C.Eysenck, Test Booklet Junior Eysenck Personality Inventory, London, University of London Press, 1965. p.15.

Otis Quick-Scoring Mental Ability Test[1]

Test Administration

The test papers are handed out and the children are asked to write their names, age, date of birth, school and today's date in the spaces indicated.

The children are asked to read the first page and try the sample questions. Having allowed sufficient time for all the children to have done this the following instructions are given:

"As it says on the first page of the booklet the test contains 80 questions. You are not expected to be able to answer all of them but do the best you can.

You will be allowed half an hour for the test. Try and get as many right as possible.

Be careful not to go so fast that you make mistakes. Do not spend too much time on any one question.

No questions about the test will be allowed after the test begins.

Make your crosses heavy so that they can be clearly seen, and be sure not to put more than one cross in any row of circles.

Is there anyone who does not understand the first page?"

The examiner makes sure that all understand how to proceed and then says:

"Now turn the paper over. Open the flap at the right so that you can see the rows of circles in which you are to put the answers for Page 1.

As soon as you finish page 1, you are to open the booklet and do pages 2, 3 and 4 in the same way.

Now take your pencils and begin."

A stopwatch is then started. At the end of half an hour the examiner says:

"Time is up. Everyone stop. Close the test booklet."

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[1] Arthur S. Otis, Manual for Otis Quick Scoring Mental Ability Tests, London, George G. Harrap & Co., pp. 2-3.

Total Proportional Strength

Administration of Strength Tests[1,2]

Right and Left Grips

The right hand is tested first, the hand being lightly chalked with magnesium carbonate before the tester places the eliptical spring manuometer in the hand. The instrument is placed so that its edge lies between the first and second joint of the fingers, with the dial towards the palm. The subject may use any movement to obtain maximum grip provided his hand or arm does not touch his body or any object. The manuometer is read, the pointer returned to zero and the score is recorded to the nearest pound.

Back Strength

The subject stands on the base of the back and leg dynamometer, with his feet parallel and about eight inches apart. The insteps are opposite the point where the instrument is attached to the wooden base.

The hands are lightly chalked with magnesium carbonate and the subject stands erect, with his hands, fingers extended, on the front of his thighs. The bar is attached to the chain so that it lies just below the fingertips. With the knees straight, the subject bends forward slightly and grasps the bar tightly with a divided grasp, one palm forwards and the other backwards, hands shoulder width apart. The tester holds the subject's hands to prevent them from slipping off the bar and the subject exerts a steady vertical pull until the pointer of the instrument records the maximum effort. The score is recorded to the nearest pound.

Leg Strength

The subject stands on the dynamometer platform as for the back-strength test. With hands lightly chalked with magnesium carbonate the bar is held at groin level with palms downwards (overgrasp), the hands being close to the central hook. The loop in the belt is carried across the lower back (sacral and upper gluteal region), the free end is passed over the other end of the bar, passed up through

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[1] H.Harrison Clarke, Application of Measurement to Health and Physical Education, 4th Edn., Englewood Cliffs, N.J. Prentice Hall Inc., 1967, pp.147-152.

[2] W.R.Campbell and N.M.Tucker, An Introduction to Tests and Measurements in Physical Education, London, Bell, 1967, pp.110-115.

against the subject's hip and pulled tight.

The subject keeps his head up, and with his back held straight, his knees are bent in order that the tester can slip the chain onto the hook. The chain should be of such a length that at maximum pull, the subject's knees are almost straight. There should be approximately an angle of 120° between the thigh and leg in the starting position. The subject lifts vertically, holding the bar during the lift: until the pointer records the maximum effort. The score is recorded to the nearest pound.

Matching Tests Form

1	Name	Group No.	Matched Pair
2	Address		
3	School		Class
4	Swimming Club		
5	Best Stroke		
6	Age Group Competition Placings	1st 2nd 3rd Other	
7	Games/athletics/activities at which you compete regularly for		
	(i) Your School		
	(ii) A Club		

8	Date of birth		
9	Occ.		
10	Otis		
11	Right Grip		
12	Left Grip		
13	Leg		
14	Back		
15	Total		
16	Weight		
17	Strength/Weight ratio		
18	Height		
19	Ponderal Index		

Date of Test _____ Venue _____

BD/CRT/RES/3

Test Results - Individual Record Sheet

No.	Init.	D.O.B.	R.G.	Sch.	I.	Ht. Wt.	T.P.S.	L.G.1
Name								
Address								
Date								L.G.2
A								
B								
C								L.G.3
D								
E								
F								SUC
G								
H								
I								Drop
J								
O								
Q_2								
Q_3								
Q_4								
Extr.								
Anx								
Cort.								
Ind.								
Ey E								
Ey N								
Ey L								

Initial Letter sent to Clubs

UNIVERSITY OF DURHAM

COLLEGE OF THE VENERABLE BEDE

Dear .....

I am writing to ask whether you would be interested in taking part in a Research Study I am undertaking. The research is outlined on the enclosed sheet and is, I believe, concerned with an important aspect of swimming. The project has the support of the University of Durham and several leading figures in the swimming world in particular Mr.Norman Sarsfield and Miss Helen Elkington. Permission to approach clubs has been granted by the N. & D./Yorks A.S.A. Executive Committee.

Briefly I would like to give a series of tests to those boys in your club who competed as 11 year olds in the Age Group programme last year i.e. those boys born in 1955 plus any other boys who may not have competed last year but will be competing as 12 year olds during 1967. This year two sets of tests would be needed. I am hoping to follow through those boys who remain in the clubs and in the following years only one set of tests would be necessary. I would like therefore to come to one of your club evenings, or on another evening that may be convenient to you, and give the first series of tests to the boys that you have in this Age Group.

I would like to apologise for this letter being duplicated but as I hope to gain the support of most of the clubs in the N.E. I trust that you will understand the difficulties of writing to everyone individually. Similarly in an attempt to reduce the amount of time needed for a reply I have tried to simplify the procedure by enclosing a form covering some of the points it would be necessary for me to know.

I do hope that you will be interested in taking part in the project and I would be most grateful if you could let me know fairly soon.

I thank you in anticipation.

Yours sincerely,

Mr.C.R.Tattersfield, M.Sc.
Lecturer in Physical Education
(A.S.A.Coach)

CRT/RES/367/3

Initial outline of research plan sent to clubs

An Investigation into possible effects on the personality of boys 11-14 years of age through participation in intense individual competition

Researcher

The researcher is Mr.C.R.Tattersfield M.Sc., Lecturer in Physical Education at Bede College, Durham, and an A.S.A. Coach. The research proposal has been approved by the Senate Higher Degrees Committee of the University of Durham for submission as a Ph.D. thesis.

Purpose of the Study

The major purpose of the study is to investigate whether there are changes in personality factors of boys who compete in intensive individual competition over a period of years as compared with boys who do not. The results obtained should provide a basis for decision on the desirability or otherwise of placing boys of this age in intensive competitive situations. In interpreting the results obtained it is intended to relate the findings to wider aspects of education. Subsidiary purposes include comparisons between "competitive boys" who remain in competition and those who drop out and between those who are more or less successful.

Experimental Groups

The competitive situation chosen for the study is that of Age Group Swimming. As many readers will know this is a competition recently introduced into this country where boys and girls of the same age group compete against each other as 11-12-13-14 year olds. This competition has been taking place in other countries for several years notably in the U.S.A. where the competitive age groups are becoming progressively younger. For this study it is proposed to follow the careers of a group of boys in N.E. England who competed as 11 year olds in the 1966 season. It is hoped to obtain the co-operation of the Swimming Clubs in the N.E. so that the swimmers of this group can be tested.

The control group would consist of boys of the same age who do not take part in individual competitive sport. It is hoped to obtain the co-operation of a few Secondary Schools in the N.E. so that a number of boys can be tested.

Matching

In order to eliminate as many variables as possible it is proposed to equate the groups on a matched pairs basis.

1. Age (chronological)
2. Socio-economic background-Registrar General's Divisions.
3. Physical status - strength. Total proportional strength.
4. Mental ability - Otis Quick Scoring Mental Ability Test.

Obviously in the initial matching process it will be necessary to test a great many more boys for the control group than for the experimental group. It is hoped that the testing for matching the groups will be completed by the early part of the summer of 1967. The time required for the matching tests would be 30-40 minutes for a group to complete the Mental Ability Test and Questionnaire and 5 minutes per boy for the Strength tests.

Personality Factors

These are to be measured by means of two tests.

1. H.S.P.Q. Cattell
2. Junior Eysenck Personality Inventory

It is hoped that these tests can be administered to the experimental and control groups initially during June and July 1967 when the boys are in their first year of Secondary School, and repeated during the same months in 1968-1969. Once the initial matching has been completed these are the only tests to be administered and would be completed by a group of boys in about $1\frac{1}{2}$ hours.

Return form from Clubs

Club.....

Secretary.....

Address.....

Telephone.....

Please indicate whether you would be interested in taking part in the research outlined in CRT/RES/267/2 on possible effects on personality through competitive situations.

We are interested in taking part.

We are not interested in taking part.

If the answer to the above is in the affirmative would you please complete the reply below.

Approximate number of boys of this age group who could be tested .....

Suggested dates and times for the testing.....

.....

Place at which testing could take place .....

.....

.....

Would there be anywhere where the boys could sit down to answer a short mental test?.....

Would it be reasonably quiet? .....

Further comments.

Signed .....

Club position.....

Sample letter requesting parental permission for participation of boys in the research.

Adwick School,
Woodlands,
Nr.Doncaster.

Dear Parent,

The school is co-operating in a piece of educational research which is being conducted by Mr.C.R.Tattersfield, Lecturer in Physical Education at Bede College, Durham, the research being under the auspices of the Department of Education at the University of Durham. The research is concerned with the possible effects of intensive competition in sport on the developing personalities of boys born in 1955. This school will act as one of the control groups - i.e. will be used as a guide to establish usual standards in boys for weight, height and personality. A number of tests are to be given; these comprise a series of four strength tests, height and weight, a short mental test and two personality inventories. It is planned to administer these on July 12th this year, the latter two tests will be repeated at about the same time in 1968, and 1969.

The tests will be administered by Mr.Tattersfield assisted by members of the school staff, during school time. The test results are completely anonymous, that is to say that "John Doncaster" becomes simply "No. 129" for the purposes of the study.

It is hoped that parents of those boys in the school who were born in 1955 i.e. pupils in the first form whose birthdays fall between January and September 1955 inclusive, will be agreeable to their sons taking part in this project; however, any parent has complete freedom to opt out and should anyone wish to do so they are asked to return the form below to the Headmaster.

Yours sincerely,

Headmaster.

I do not wish my son ..... to take part

in the research study being pursued at Adwick School.

Signed .....
(Parent)